No 0000027

99562

WORK PLAN

R E M II

PERFORMANCE OF REMEDIAL RESPONSE ACTIVITIES AT UNCONTROLLED HAZARDOUS WASTE SITES

U.S. EPA CONTRACT NO. 68-01-6939

CAMP DRESSER & McKEE INC.
PRIME CONTRACTOR

WORK PLAN

SKINNER LANDFILL

WEST CHESTER, OHIO

VOLUME I - TECHNICAL SCOPE OF WORK

AUGUST 1985

Prepared for:

U.S. Environmental Protection Agency
Emergency and Remedial Response Branch
Region V
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REMEDIAL INVESTIGATION/FEASIBILITY STUDY
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SECTION 1

INTRODUCTION

1.1 SITE LOCATION AND HISTORY

The Skinner Landfill is located approximately 15 miles north of Cincinnati in Union Township, Butler County, southwestern Ohio (Figure 1-1). The Skinner property comprises about 78 acres of hilly terrain situated east of Cincinnati-Dayton Road and west of a Consolidated Rail Corp. (Conrail) right-of-way near the Town of West Chester (Figure 1-2). The property is bordered on the north by wooded land and on the south by wooded and agricultural land. There are numerous single-family residences within 2000 feet of the site in all directions but northward. An elementary school is located on the Cincinnati-Dayton Road just across from the Skinner property (Figure 1-3).

Waste activities at the site apparently began 40 to 50 years ago. General municipal refuse was disposed in areas not being used for sand and gravel extraction. As early as 1964, there is confirmation that small amounts of industrial waste, including some now considered hazardous, were disposed of at the Skinner Landfill. Industrial waste activity apparently increased in the early 1970's, culminating in the situation discovered in April 1976.

While fighting a small brush fire at the Skinner site on April 18, 1976 firemen noticed a lagoon filled with black, oily-looking liquids. This observation, and a series of citizen complaints about heavy smoke and chemical odors during the previous two weeks, caused local health officials to request an investigation by Ohio EPA (OEPA) into possible chemical waste disposal at the site. Although initially allowed on-site, OEPA personnel were denied permission to observe the lagoon.

When the OEPA returned with a search warrant the following week, the area of the lagoon showed evidence of recent regrading. OEPA discussions with neighboring residents revealed that heavy equipment had been operating at the site since the afternoon of the initial inspection and throughout the weekend. During the site visit, strong chemical odors were present and about 100 drums marked "Chemical Waste". Later that week, inspection of aerial photographs taken in February 1976 confirmed that there had been a lagoon in the recently regraded area. These photographs also showed several hundred drums scattered throughout the site.

Early the next week, the first week of May, the OEPA received a report from local residents that trucks had left the Skinner site over the previous weekend, late at night, with their lights off until they had driven one-half to one miles from the site. When the OEPA attempted to inspect the site the next day, Mr. Skinner, then owner and operator, claimed that military ordinance and chemical warfare

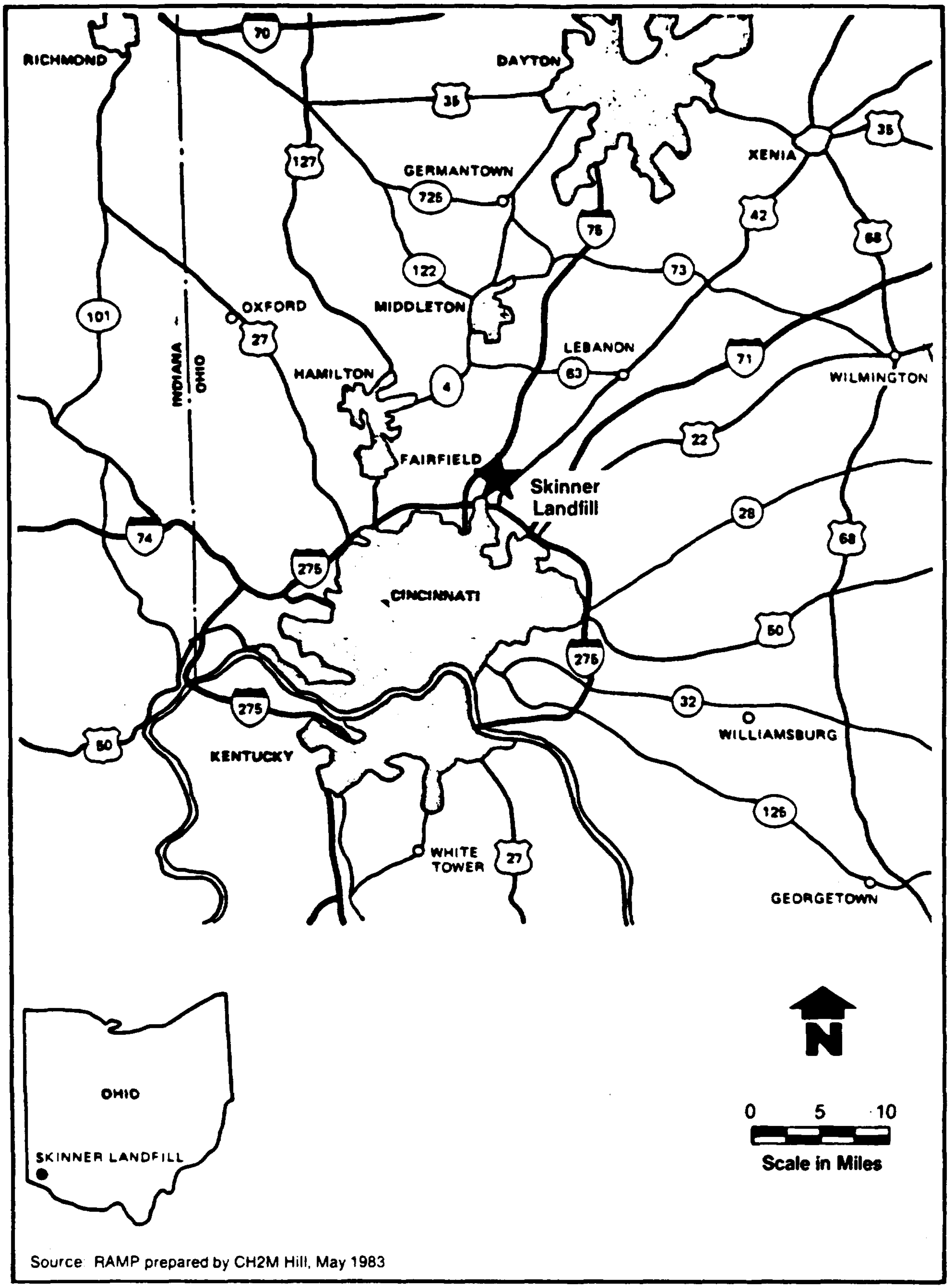

FIGURE 1-1 VICINITY MAP, SKINNER LANDFILL SITE

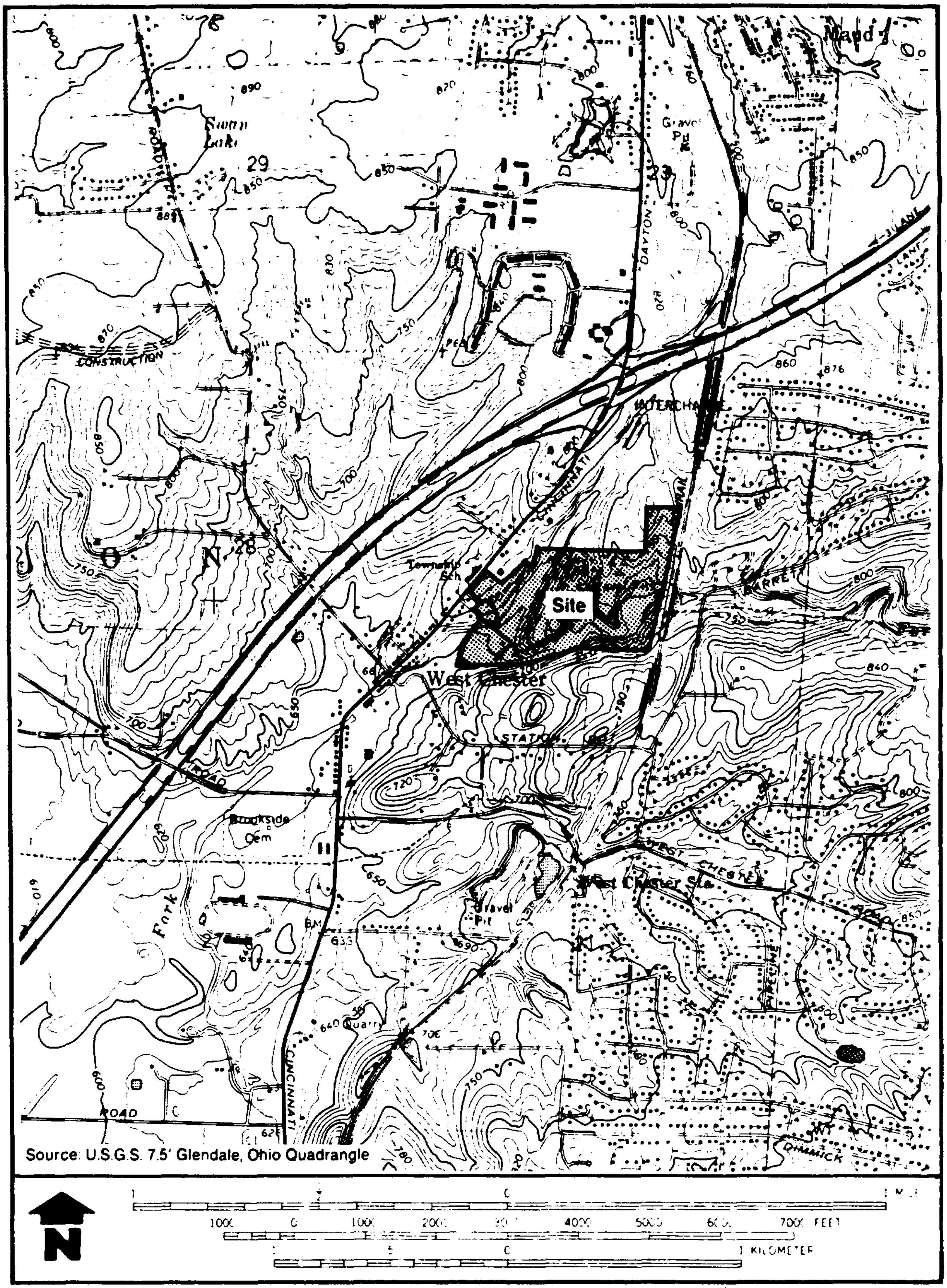

FIGURE 1-2 LOCATION MAP, SKINNER LANDFILL SITE

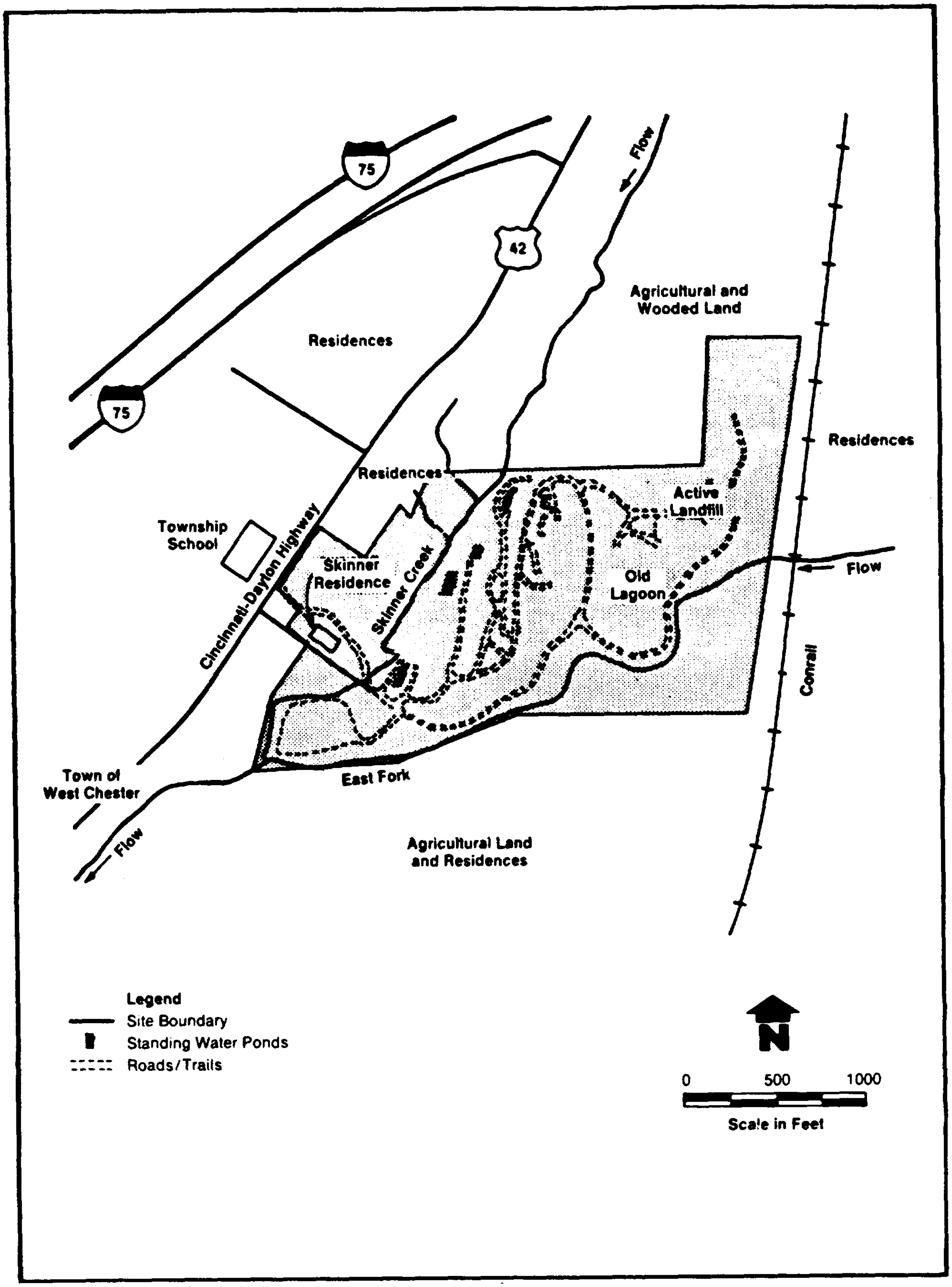

FIGURE 1-3 SITE MAP, SKINNER LANDFILL SITE

agents had been buried at the site. Pentagon assistance was requested, but no further on-site inspection was done that week. Heavy equipment was heard to be operating throughout that weekend.

On May 11, 1976, OEPA and a U.S. Army Special Unit entered the site under a search warrant and excavated a trench into the buried lagoon. Samples of ooze taken from the trench and from crushed drums excavated from the trench contained high concentrations of pesticide intermediates, some volatile organic compounds and several heavy metals. These waste materials are listed in Table 1-1. It was also noticed that many of the drums which had been present at the surface during earlier site inspections were no longer present.

From July 1976 to July 1977, the Skinners retained H.C. Nutting Company to conduct a shallow geologic investigation and the OEPA made a further site inspection and sampling visit. From August 1977 to January 1979, OEPA unsuccessfully tried to get a court ruling to order Skinner to remove chemical waste from his site. Subsequent appeals were also unsuccessful. In July 1982, FIT installed four monitoring wells in the lagoon area for MITRE characterization of the site. Volatile organic compounds were found in the monitoring well located southeast of the buried lagoon, indicating the release of hazardous contaminants to groundwater and their migration toward nearby East Fork. The parameters detected in this and other environmental samples at the Skinner Landfill are listed in Table 1-1. The analytical data for this well, and for all other sampling activities at or related to the Skinner Landfill, are contained in Appendix A.

1.2 SITE STATUS AND PROJECT TYPE

The Skinner Landfill is a privately owned site which is actively operating. The site is authorized by OEPA to accept inert demolition debris for landfilling. Associated with demolition waste landfill operations are salvage type activities consisting predominantly of scrap metal accumulation.

In December 1982 the Skinner site was placed on the proposed NPL by the U.S.EPA for remedial actions financed by Superfund. On September 26, 1984, Roy F. Weston, Inc. began remedial investigation planning activities for the site. The Skinner Landfill is a program lead site and this work plan is for the performance of a Remedial Investigation/Feasibility Study (RI/FS).

1.3 OVERVIEW

This work plan has been prepared in accordance with the requirements of the Work Plan Memorandum (Document No. 130-WP1-WM-AKVE-1) and the Work Assignment (No. 31-5L73.0) for the Skinner Landfill. The purpose of this RI/FS is to assess and evaluate the potential extent and

TABLE 1-1

HAZARDOUS CHEMICALS FOUND AT SKINNER LANDFILL

I. WASTE SAMPLES

Trichloropropane
Dichlorobenzene
1,3 Hexachlorobutadiene
Naphthalene
Hexachlorocyclopentadiene (C-56)
Methyl Naphthalene
Isobutyl Benzoate
Hexachloronorbornadiene
Octachlorocyclopentene
Heptachlornorborene
Hexachlorobenzene
Chlordane
Methyl Benzyl Phenone
Octachlorpentafulvalene
Benzoic Acid
Phenols
Cyanide
Cadmium
Chromium
Lead
Zinc
Copper

II. ENVIRONMENTAL SAMPLES

DDT
Bis-(2-chloroisopropyl)ether
Benzene
1,2-Dichloroethane
1,1,1-Trichloroethane
1,1-Dichloroethane
Chloroethane
Chloroform
Trans-1,2-Dichloroethylene
1,2-Dichloropropane
Methylene Chloride
Toluene
Vinyl Chloride
One tentatively identified acid extractable
Seven tentatively identified base/neutral extractables
Twelve tentatively identified volatiles

magnitude of on-site contamination and, if appropriate, recommend a cost-effective, viable remedial action alternative for mitigating the hazard posed by the contamination. The objectives for this RI/FS are:

- Determine if pollution at the Skinner Landfill site poses a threat to health and/or the environment.
- Determine the characteristics, extent and magnitude of contamination on the site.
- Identify the pathways of contaminant migration from the site, and characterize the contaminant flow across the site boundaries.
- Evaluate the nature and magnitude of contamination, if any, in the nearby private water wells.
- Define on-site physical features and facilities that could affect contaminant migration, containment, or cleanup.
- Develop, screen and evaluate potential remedial action alternatives.
- Recommend the most cost-effective remedial action alternative(s) that adequately protects health, welfare and the environment.
- Prepare a conceptual design of the recommended alternative.
- Support future enforcement action under CERCLA.

The technical approach to completion of the RI/FS, which is described in Section 4 and 5 of the Work Plan, contains fourteen (14) major technical elements, seven (7) in the RI and seven (7) in the FS.

<u>Remedial Investigation</u>

- Study Area Surveys
- Source Characterization
- Site Characterization
- Bench/Pilot Testing
- Contaminant Pathway and Transport Evaluation
- Public Health Evaluation
- Remedial Investigation Report

<u>Feasibility Study</u>

- Preliminary Remedial Alternative Development
- Remedial Alternative Screening
- Remedial Alternative Analysis

- o Comparative Evaluation of Acceptable Alternatives
- o Feasibility Study Report
- o EPA Decision Document Preparation Assistance
- o Pre-Design (Conceptual Design) Reports

Other technical elements include:

- o Work Assignment Completion Report
- o Community Relations
- o Quality Assurance
- o Technical and Financial Management

This Work Plan presents the site background, the technical approach to site investigation and feasibility study activities, schedule for project execution, staffing plan, subcontracting plan, and special equipment needs for conducting an RI/FS at the Skinner site. A draft work plan will be submitted for the U.S.EPA and the OEPA review. After completion of the review, the REM II site team will meet with the agencies to discuss the draft document. Review comments will be incorporated in a final work plan document, which will be submitted within 10 working days following receipt of written agency comments. Copies of all subcontract agreements will be forwarded to the U.S.EPA site officer for information purposes.

SECTION 2

INITIAL SITE EVALUATION

2.1 SITE DESCRIPTION

2.1.1 Environmental Setting

The site is situated in a highly dissected area that slopes from a till-mantled, bedrock upland at elevations of 850 to 900 feet (MSL) to a broad, flat-bottomed valley, which is occupied by Mill Creek, at elevations of 600 to 650 feet. Elevations within the Skinner property range from 650 to 750 feet. The property is traversed by two streams, one of which -- East Fork -- flows approximately west to east through the southern part of the site. The other stream (hereinafter called Skinner Creek) flows southwesterly, parallel to and about 600 feet east of Cincinnati-Dayton Road. In the angle between the two streams is an upland having two, en-echelon, elongated hills, which are also oriented roughly parallel to the Cincinnati-Dayton Road. Several ponds are present on the western flank of the western hill, which were likely created from past sand and gravel extraction activities.

In general, the site is underlain by relatively thin glacial drift (less than 35 feet) over interbedded shales and limestones of Ordovician age. Based on water well logs and boring logs from the limited on-site investigations (FIT and H.C. Nutting), the soils are mixtures of sand, silt and clay in varying proportions. The soil stratigraphy is not well-defined. Boring logs indicate that bedrock is about 15 feet below the surface on the west side of the old lagoon and drops off sharply eastward.

There appears to be a narrow buried valley that branches off from the Mill Creek buried valley towards West Chester. Drift thicknesses of up to 100 feet were found in West Chester, where a substantial layer of sand and gravel has served as a water supply for many residences. This aquifer could be expected to provide yields of 100 gpm or better. The buried valley may extend into the Skinner property at its southwestern corner, in the vicinity of the confluence of the two streams. Preliminary hydrogeologic evaluations by St. John (1981) and Hosler (1976) concluded that groundwater flow in the vicinity of the site was most likely to the southwest, toward the buried valley. However, the depth and configuration of the water table in the site area are not well-defined.

2.1.2 Site History

A detailed site/history/chronology for the Skinner Landfill was presented in the initial interim report (November 1984) and is summarized below.

The Skinner property was first used as a landfill in approximately 1934. No information is available to document what type of materials were disposed of at that time. In August 1959 the first complaint was received as a result of alleged burning and irritating smoke coming from the Skinner property. Mr. John R. Kennedy, Sanitarian for the Butler County Health Department, responded to the complaint with a letter stating that the dump was disposing of trash from a paper plant. Rags and other materials used in the paper-making process were being disposed of at the site. There was no evidence of garbage or chemical odors coming from the dump.

On May 2, 1975, the Union Township police and the fire department reported a fire along with a black cloud of smoke coming from the Skinner Landfill. This incident was investigated by the Southwestern Ohio Air Pollution Control (SWOAPC). They reported that the fire originated from two five-gallon cans of cleaning solution. A second fire was reported on April 19, 1976. Heavy smoke and odors had been coming from the Skinner Landfill during the period April 8 to April 19, 1976. The citizens also reported irritated eyes on April 16, 1976. In addition, the citizens reported seeing two tank trucks entering and leaving the landfill. The SWOAPC investigated the complaint and reported that the latest observed fire was from old tires and scrap lumber. In the report from SWOAPC it was stated that no chemical odor could be discerned. One fireman reported that they feared the fire would reach a nearby lagoon of what looked like black, oily liquid substances. Firemen estimated the lagoon to be approximately 35 feet by 40 feet.

On April 21, 1976 the OEPA was asked by the Hamilton City Health Department to inspect the Skinner Landfill. The request was based on the April 19, 1976 fire incident and the department's suspicion that industrial waste from the Chem-Dyne Corporation was being disposed of at the Skinner Landfill. Chem-Dyne denied that any of their waste was being disposed of at the Skinner Landfill site. On April 22, 1976 the OEPA and SWOAPC inspected the Skinner site with the owners' prior approval. When the inspectors attempted to go to the site of the fire at the lagoon area, permission to continue the inspection was withdrawn. The inspectors from the OEPA and the SWOAPC along with the Butler County Health Department and the Butler County Sheriff's deputies returned to the site with a search warrant to continue the inspection. The following observations were made:

1. One inspector noted odors he described as chlorinated hydrocarbons. A second inspector described the odors as chlordane (intensity #2 scale, distinct and mild).

2. 100 plus, 55-gallon drums marked "Chemical Waste." Pictures were taken; however, no samples were obtained. One drum was labeled "Carbon Disulfide."

3. The area of the lagoon noted during the April 18, 1976 fire was observed. There was a strong odor in this area. The area had been recently graded. This grading began the afternoon of the original inspection (April 22, 1976). Also a citizen that lives near the Skinner Landfill site complained to SWOAPC of a very strong "varnish or turpentine-type odor" on the afternoon of April, 22, 1976. The lagoon area was noted to be directly above (vertically) the site of the April 18, 1976 fire, and directly above (vertically) the spot in which inspection was denied on April 22, 1976. The area was photographed and samples were taken from surface puddles. An inspector also took a two-quart sample from a pool at the foot of the hill "which had a dark fill covering."

April 28, 1976 aerial photographs taken by Ryan Engineering as part of their work for designing sanitary sewers for Butler County were received. The photos taken on February 7, 1976 included the Skinner site and confirmed that the lagoon area was located at the spot of the recent grading. The photographs also revealed "hundreds of 55-gallon drums on the property." On May 3, reports were received by the OEPA that the Skinners had been trucking unknown materials off the premises very late at night. The trucks left the premises with their lights off. The following day representatives of the OEPA and Butler County Sheriff's department returned to the Skinner Landfill with a search warrant to conduct further investigations. During this investigation the Skinners stated that the following materials were buried at the landfill:

- Nerve gas
- Mustard gas
- Incendiary bombs
- Phosphorous
- Flame throwers
- Cyanide ash
- Other explosive devices.

Discussions with an official of the Hamilton County Health Department and a former public official of Reading, whom the Skinners stated had information about the materials on site confirmed only that cyanide ash, phosphorous, and one or two flame throwers with canisters had been disposed of by the Skinners. No confirmation of the other materials claimed to be disposed of on the site by the Army or anyone else knowledgable of the site was available.

On May 11, 1976 representatives of the OEPA, U.S. Army Special Military unit and the Butler County Sheriff's department entered the Skinner Landfill and proceeded to the lagoon area that had been

> ...leachate (was) seeping from near the buried lagoon area...
>
> We detected what appeared to be leachate seeping from near the buried lagoon area...
>
> We observed drums stacked near the creek which runs through the property. The drums were filled with a white-colored semi-solid. Several drums were leaking and had drained into a nearby creek. Mr. Albert Skinner said the material was used for dust control on his driveways...
>
> A faint chemical odor was detected in area of buried lagoon and recent demolition disposal. Water samples were taken of the stream and leachate seep."

On August 22, 1977 legal proceedings against the Skinner Landfill were initiated by the State of Ohio. The Court of Common Pleas, Butler County, Ohio entered a final judgment in January 1979 enjoining the Skinners from continuing to use their property as a chemical waste disposal facility but the court did not require the Skinners to remove the wastes already present on the site. Butler County Court of Appeals on August 1, 1979 affirmed the Court of Common Pleas' opinion of January 1979.

The OEPA requested a reconnaissance survey of the Skinner Landfill on November 28, 1979. On September 16, 1980 the OEPA completed the preliminary assessment of the site. Monitoring well installation in the area of the old lagoon was completed on July of 1982 and later the same month FIT conducted groundwater sampling at the wells and documentation of site location and inspection information.

On September 9, 1982 Mrs. Skinner was informed by the OEPA that the Skinner Landfill had been submitted to the U.S.EPA for inclusion on the proposed NPL. It was placed on the proposed NPL in December 1982. The U.S.EPA conducted a responsible party search of the site in April 1983. Roy F. Weston began the remedial investigation activities in September of 1984.

2.2 CONTAMINATION PROBLEM DEFINITION

2.2.1 Waste Disposed of at Site

The Skinner Landfill includes a wide variety of waste types ranging from inert demolition debris to pesticides. The exact types of hazardous materials accepted and their volumes are not known. Site inspections and laboratory analyses of unknown liquids have shown the following general types of materials and compounds to be present on-site:

- o Demolition wastes (wood, concrete, brick, etc.)
- o Scrap metal, appliances, car parts, and storage tanks
- o Municipal refuse
- o Waste fiberglass
- o Limesludge
- o Solidified sludges of paints and coatings
- o "Dirty thinners"
- o Organic compounds:
  - Volatile compounds
  - Acid compounds
  - Base/neutral compounds
  - Pesticide intermediate compounds.

2.2.2 Toxicity of Contaminants

The compounds, which have been identified and are known to be impacting the environment, have been used to evaluate the toxicity of contaminants. These parameters have been identified in samples from Monitoring Well No. 6, which is located southeast of the lagoon and from five (5) samples which were collected during the excavation of the lagoon. The results of sampling Well No. 6 and the excavated lagoon are provided in Appendices A and B, respectively.

o Major Inorganic Substances

Cadmium - Cadmium has a cumulative and toxic effect on man in all its chemical forms. Adverse effects occur in the arteries, kidneys and lungs. Initial symptoms may be cramps, nausea, vomiting, and diarrhea.

Treatment of laboratory animals with cadmium by injection results in injection-site sarcomas and testicular tumors of Leydig cells, but the relationship between human exposure to cadmium and cancer of the prostrate, lung, or kidney, as suggested by several epidemiology studies, has yet to be firmly established. Furthermore, cadmium has not been shown to be mutagenic, although it may impair DNA reproduction. Cadmium is a well-studied animal teratogen, but similar potential in humans has not been convincingly demonstrated.

Chronic exposure of humans to cadmium is also suspected to produce hypertension, anemia, sensory loss (particularly smell), endocrine alterations, and immunosuppression.

Chromium - Small amounts of chromium are essential for mammals because of its interaction with insulin. Chromium salts taken orally are rapidly eliminated from the human body; however, large doses of chromates can corrode the intestinal system.

The principal effect from acute poisoning from hexavalent chromium, CR(VI), is tubular necrosis of the kidney. The chronic toxicity of Cr(VI) has been observed in several mammalian species in drinking water at concentrations greater than 5 mg/l. Cr(VI) can also produce hemorrhaging of the gastrointestinal tract. Hexavalent chromium compounds are carcinogenic in humans when inhaled, but it is uncertain whether ingestion poses comparable risks. Trivalent chromium compounds, Cr(III), can cause central nervous system and hepatic effects.

Copper - Copper is essential to plants, animals, and man. A deficiency of copper could cause nutritional anemia in infants, but excessive copper is naturally excreted by the body. Very large doses of copper produce emesis and prolonged ingestion may result in liver damage.

Cyanide - At this point in time there is no evidence for the accumulation of the cyanide in the human body, and continual ingestion of small doses can be slowly but adequately metabolized to less toxic compounds. Ingestion of cyanide at toxic levels produces initial symptoms such as confusion, nausea, and vomiting.

Iron - Iron is an essential element in plants and animals. However, the ingestion of excess amounts of iron produces toxic effects primarily associated with gastrointestinal irritation. Severe poisoning may cause gastrointestinal bleeding, pneumonitis, convulsions, and hepatic toxicity. Chronic ingestion of excess iron may lead to hemosiderosis or hemochromatosis.

Lead - Lead is a toxic material that accumulates in the skeletal structure of man and animals. Since human absorption of ingested lead is small, single large doses do not cause a problem. However, chronic exposure to high lead levels has very severe neurological effects. The sensitivity to lead toxicity varies according to individuals, with small children being the most vulnerable. Low level exposure of lead to small children or pregnant women may cause significant neurotoxicity. Lead has been shown to be teratogenic in a number of animal studies and caused an increased incidence of stillbirths and miscarriages in occupationally exposed women.

The major effects caused by exposure to lead are toxicity to the hematopoietic system and neurological effects. Hemosynthesis is inhibited by the effect of lead on a number of steps in the biosynthetic pathway.

Mercury - Mercury compounds are highly toxic to man and animals and have a long retention time in the human body. Mercury salts be absorbed in the intestinal tract and bioaccumulate in the kidney and liver. The compound of methyl mercury is transported by red blood cells and can cause permanent brain damage. Methyl mercury is about 50 times more toxic to mammals than inorganic mercury salts.

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Zinc - Zinc is an essential element in the body and more problems have been associated with zinc deficiencies than with exposure to elevated concentrations. However, zinc does exhibit some toxic effects at high levels. Skin and eye irritation are produced by contact with high concentrations of zinc chloride. Ingestion of excessive amounts of zinc may cause fever, vomiting, stomach cramps, and diarrhea. In a study on rats, ingestion of 0.25% zinc in a diet (providing a dose of approximately 125 mg/kg/day) produced growth retardation; hydrochromic anemia and defective mineralization of bone. Dietary levels less than 0.25% had no effect in the same study.

o Major Organic Parameters

Toluene - Acute toluene poisoning has the effect of a narcotic, which may include the stages of intoxication to comatose.Chronic poisoning is characterized by anemia, leucopenia and enlarged liver in rare cases. Initial effects of toluene poisoning may be headaches, nausea, eye irritation, loss of appetite, bad taste, impairment of reaction time and coordination.

Vinyl Chloride - Vinyl chloride is a known carcinogen and is considered an equivocal tumorigenic agent. It also has a neoplastic effect. Chronic exposure of vinyl chloride results in liver injury in rats. It is highly irritating when inhaled or when comes in contact with skin and eyes. Circulatory and bone changes in fingertips have been reported in workers handling unpolymerized materials.

1,2 Dichloropropane - This compound is a known mutagen which exhibits a moderate irritation effect. It can cause dermatitis and is regarded as one of the more toxic chlorinated hydrocarbons. Animals exposed to high concentrations often show marked visceral congestion, fatty degeneration of liver and kidney, and less frequently of the heart.

Chlordane - Chlordane is an insecticide which is considered an extremely hazardous substance. Chlordane is readily absorbed through the skin as well as through other portals. It is considered a mutagen and can exhibit carcinogencic effects. Poisoning may also occur through inhalation and ingestion. Chlordane is a central nervous system stimulant whose exact mode of action is unknown, but it is suspected that it may involve microsomal enzyme stimulation.

Naphthalene - Naphthalene is typically used an insecticide and is also used for smokeless powder, cutting fluid, lubricant, synthetic resins, synthetic tanning, preservative and antiseptic. It is considered an equivocal tumorigenic agent. Systemic reactions include nausea, headache, diaphoresis, hematuria, fever, anemia, liver damage, vomiting, convulsions, and coma. Poisoning may occur via ingestion of large doses, inhalation or skin absorption.

Hexachlorobenzene - Hexachlorobenzene is a suspected carcinogen and has a neoplastic and teratogenic effect. When heated the compound decomposes and emits highly toxic fumes of chlorides.

Heptachlor - Heptachlor is the intermediate of the heptachloroborene compound found at the site. It is an insecticide which can be considered to be extremely hazardous. It is known to be a mutagen and has exhibited carcinogenics effects. In men, a dose of 1 to 3 grams can cause serious symptoms, especially where liver impairment is the case. Acute symptoms include tremors, convulsions, kidney damage, respiratory collapse and death.

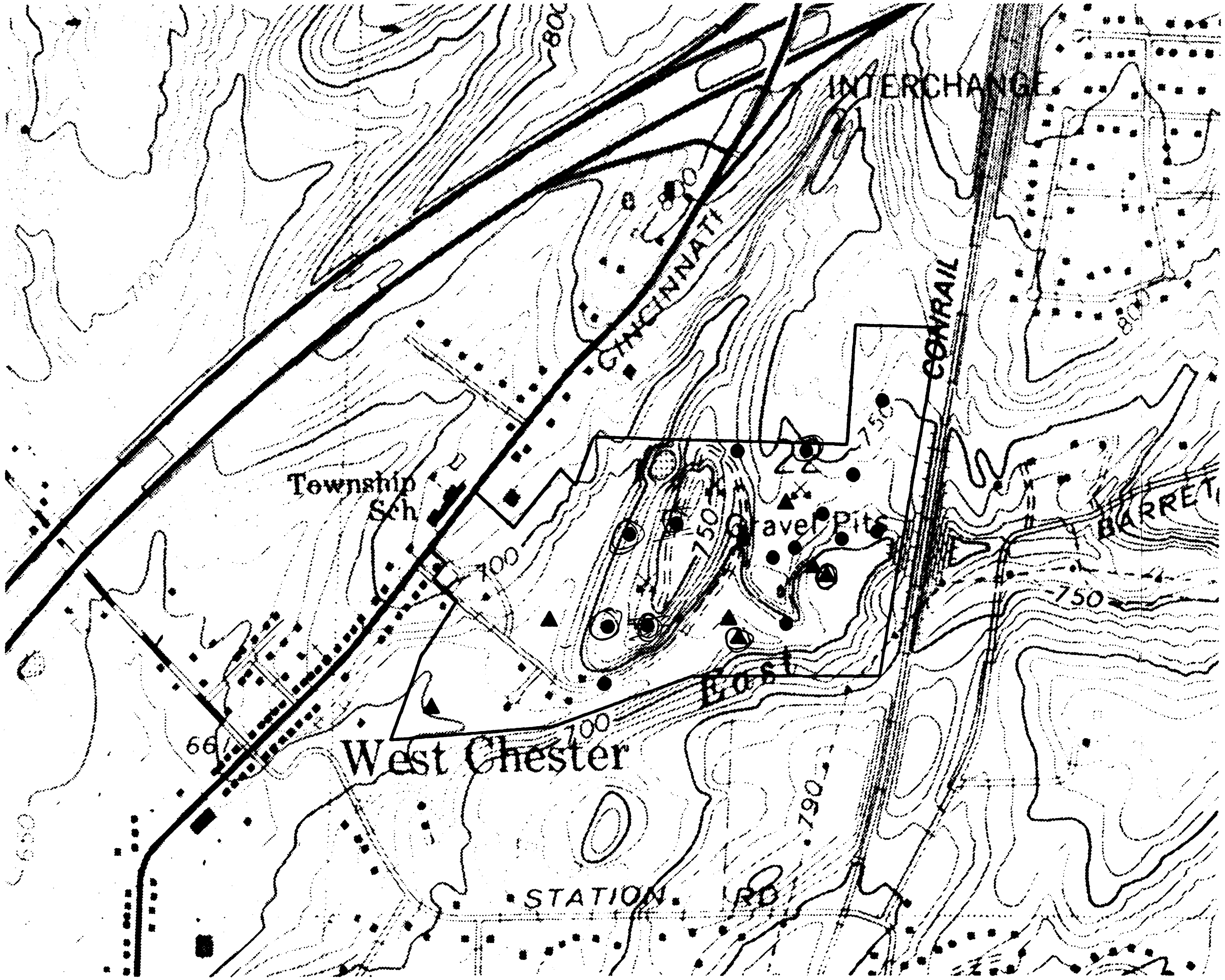
2.2.3 Degree of Site Contamination

To facilitate location descriptions within the site, the site area has been divided into 22 "investigation areas" on the basis of similar/contrasting features observable in aerial photographs taken February 7, 1976. These investigation areas are listed in Table 2-1 and their locations are shown in Figure 2-1.

Based on data existing as of September 1984 and information collected during two site inspections since that time (October 9, 1984 and February 28-March 1, 1985) it can be stated that there are known and potential buried sources of hazardous contaminants in the lagoon, central shoulder, and landfill. There are also scattered and localized potential sources, consisting of drums (containing liquids and solids) and surficial residues in six other areas; on the North Shoulder, Upper and Middle East Fork Valley, the Hilltop, the South Bench and the Middle Skinner Creek Valley. Some of these sources appear to date from the late 1970's, whereas others appear to be more recent and/or part of on-going activities at the site.

There is clear evidence that liquid wastes were disposed of in the former lagoon, and that the lagoon was filled in with soil shortly after the OEPA began its investigation of the site. Analysis of samples collected from a test excavation into the buried lagoon by the OEPA indicated that the wastes included pesticides, pesticide intermediates, volatile organic, and various metals. However, the actual concentrations and volume of the waste in the lagoon are not well defined.

Because of the large number of drums present in the Central Shoulder and landfill area in the 1976 aerial photographs and the available information concerning regrading at the site, there is reason to believe that a considerable number of drums are buried just north of the former lagoon. If drums are buried in the Central Shoulder area, their residual contents may represent a source of hazardous contaminants.

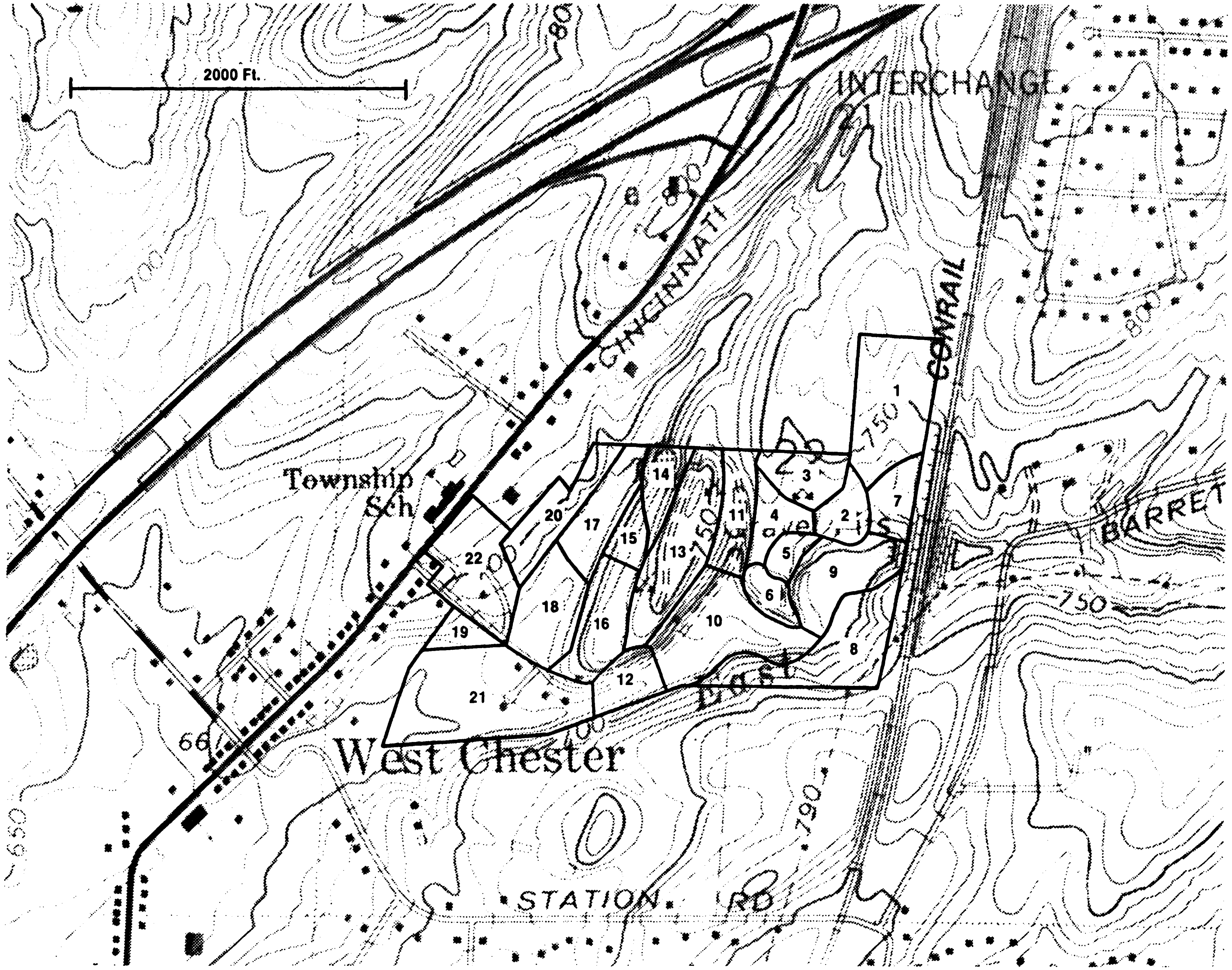


Legend

● Water Table Well

▲ Water Table Well and Deeper Piezometer Nested

FIGURE 4-3 MONITORING WELL LOCATIONS



Note: See Table 3 for designations of investigation areas.

FIGURE 2-1 INVESTIGATION AREAS - SKINNER LANDFILL

TABLE 2-1

INVESTIGATION AREAS AT SKINNER LANDFILL

1. Northeast Corner
2. Landfill
3. North Shoulder
4. Central Shoulder
5. Lagoon
6. South Shoulder
7. East Woods
8. Southeast Woods
9. Upper East Fork Valley
10. Middle East Fork Valley
11. Dry Valley
12. East Fork Narrows
13. Hilltop
14. North Bench
15. Central Bench
16. South Bench
17. Upper Skinner Creek Valley
18. Middle Skinner Creek Valley
19. West Woods
20. North Woods
21. Lower Stream Valleys
22. Homestead

Note: Refer to Figure 2-1 for area locations

At the present time, it appears migration pathways for contaminants include primarily groundwater with the potential also existing for surface water transport. Air monitoring (HNu) during the February 1985 site inspection suggests air is not a significant migration pathway under existing conditions. However based on earlier investigtions in 1976 by the Ohio EPA, air may be a significant pathway during remedial activities. Contaminant migration is discussed in greater detail below.

2.3 CONTAMINANT MIGRATION AND ENVIRONMENTAL HEALTH EFFECTS

2.3.1 Migration Pathways

Contaminant migration from the Skinner site can occur via surface water or groundwater pathways. Airborne contaminant migration does not appear to be a major pathway due to past burial of wastes but could be possible due to the volatility of some of the organic compounds. As noted in Section 2.2.2, documentation of on-site contamination, both surface water and groundwater, were obtained in May of 1976 and in July of 1982, respectively. Off site surface water and groundwater samples have been collected and analyzed to a limited extent, but have not shown any indication of off site migration.

Off site groundwater samples were taken at two domestic wells by the Ohio EPA in May of 1976. The results did not show any parameters which were tested for to be beyond the levels set for the Safe Drinking Water Act (SDWA) for maximum contaminant levels. No organic compound data was collected. The results of the analyses are contained in Appendix C. Off site surface water was sampled and analyzed at two locations. The first was at the East Fork Creek below the Skinner property and was sampled May 25, 1976. The analysis of the sample included a pesticide scan and the results showed no indication of contamination. The second off site surface water sample was collected at Skinner Creek in July of 1977. The data did not show any parameters to be over the Safe Drinking Water Act maximum levels. The results of this analysis are contained in Appendix D.

2.3.2 Potential Receptors

Groundwater and surface water are the primary receptors of concern. The receptors for groundwater contamination are unknown at this time because groundwater contamination has not been proven to exist off site and local groundwater flow directions are unknown. There are several residential wells in the area of the Skinner site which could potentially be receptors of groundwater contamination. As part of the remedial investigation a survey of residential well water quality will be conducted. This will be done in addition to the analyses of the monitoring wells installed on-site.

Surface water flow in the vicinity of the site is controlled by the sloping till-mantled bedrock uplands and the two intermittent streams: the East Fork Creek and the Skinner Creek. The Skinner Creek merges with the East Fork Creek southwest of the site. The East Fork Creek flows in a southwest-south direction for approximately three miles, at which point it flows into Mill Creek. Contamination of these bodies of water could occur from one or more of the following sources: runoff from the Skinner site, leachate seeps originating from the buried lagoon or landfill, and/or groundwater discharge. Existing data are not adequate to evaluate whether contamination has occurred at either of the creeks.

2.3.3 Environmental and Public Health Effects

Based on the available information, there appears to be both environmental and public health effects. The environmental effects involve the potential contamination to the surface water bodies, thus affecting the aquatic life. The high concentrations of metals may be bio-accumulated in fish. This would not only be affecting the environment, but also the public health as the contamination moves up the food chain. Although this is a potential threat, to date there is no data concerning surface water contamination.

There is potential for public health effects, due to the contamination of monitoring well No. 6, located southeast of the old lagoon. The degree of potential is based on whether the unconsolidated and consolidated materials will allow contaminants to migrate to the point at which it affects public water supplies.

As part of the remedial investigation, a risk assessment will be conducted to more accurately define the potential for environmental and public health effects.

2.4 INITIAL REMEDIAL MEASURES

Based on the review of available information and the February 1985 site inspection, remedial measures are considered warranted at this time. A collection of 35 drums and about 40 5-gallon pails were found in the central part of the Middle Skinner Creek Valley. These drums and pails, which were identified in the 1976 aerial photographs, were labeled "dirty thinners" and were moderately to severely rusted. One drum had a pinhole leak near the bottom. Soil at the leak gave an HNu reading of 30 ppm (span pot 8.15). Air in this drum, the top of which had rusted through at places near the rim, gave a reading of 500 ppm. Air in another drum gave a reading of 100 ppm. Ambient air downwind gave readings of 3 to 5 ppm and exhibited a distinct solvent odor. These "dirty thinners" which approximate 2,000 gallons are to be characterized and removed promptly.

In addition to the above, there were numerous drums distributed over the site containing liquids and sludges of unknown origin and content. The total number of 55-gallon drums on-site is estimated to be on the order of 500. The condition of the drums varies widely, ranging from highly rusted and corroded to intact. The location of some of the drums (e.g. 35 drums of "dirty thinners") has not changed since the aerial photographs taken in 1976.

This work plan recommends the collection of all drums existing on-site and to evaluate the potential for the drums to contain/leak hazardous materials to the environment. This action will be performed under the Immediate Removal Program and contracted directly by U.S. EPA.

The initial remedial measure should consist of the following major work elements:

- Preparation of a staging area
- Documentation of the location of all drums on-site using maps and photographs
- Inventory drums
- Collect samples from representative drums
- Analyze samples for potential hazardous constituents
- Evaluate potentially suitable alternatives for disposal
- Technical memorandum documenting all work performed.

The above activities are not included within the scope of work planned for the remedial investigation.

SECTION 3

PRELIMINARY ASSESSMENT OF REMEDIAL TECHNOLOGIES

The purpose of this section of the Work Plan is to identify potential remedial approaches which are consistent with the presently available site information. This initial identification of potential technologies was utilized during formulation of the Project Sampling and Analysis Plan in order to assure the data required to ultimately evaluate candidate remedial strategies would be collected. Criteria to screen and evaluate remedial technologies is also described. It is noted that these technologies, detailed in Subsection 5.1.2, have been identified on a preliminary basis and as more information becomes available via the remedial investigation work, additional technologies may be considered during the feasibility study.

Based on a review of all available information concerning the Skinner Landfill, it has been concluded that the buried lagoon, the central shoulder, the drums occuring at the surface, and the areas in which groundwater contamination is suspected are items for which remedial measures may be necessary. The following topics will be discussed in the preliminary assessment of remedial technologies:

- o identification of remedial technologies, performance criteria and standards for remedial technologies,
- o approach to alternative evaluation; identification of data requirements,
- o remedial investigation/feasibility study objectives and approach.

3.1 IDENTIFICATION OF REMEDIAL TECHNOLOGIES

3.1.1 Buried Lagoon

Several technologies have been preliminarily identified as possible alternative remedial measures for the buried lagoon portion of the site. These remedial alternatives consist of the following:

- o No Action
- o Source Isolation
- o Rendering the source nonhazardous
- o Source excavation and disposal

The no action alternative for this and other portions of the site, discussed below, require no explanation. The source isolation alternative consisting of isolating the lagoon and the material contained therein from the surrounding environment could be accomplished in several ways. The buried lagoon area could be capped with a highly impervious material. This would restrict recharge from entering the lagoon but would not alleviate the horizontal migration of contaminates carried by groundwater flow. Horizontal migration could be alleviated through the construction of a french drain, downgradient of the lagoon area, to intercept groundwater flow and allow removal and treatment of the groundwater if required. This alternative, in conjunction with a cap would restrict both recharge and contaminant migration. Similarily, utilization of a slurry wall or cut-off wall around the area in conjunction with a cap would restrict recharge and contaminant migration. cc

The remedial alternative of rendering the source nonhazardous could be accomplished in several ways. In-situ treatment of the wastes to immobilize, redue and/or eliminate their toxicity through the use of chemical, biological and/or physical methods could also be excavated and incinerated on-site with a mobile incinerator unit or transported off site to a fixed incinerator facility. The resulting ash could then be disposed in either a secure on-site or off site landfill facility. Further, a combination of in-situ treatment excavation, incineration and placement of a cap could be utilized to render the material nonhazardous and prevent contaminant migration.

The final preliminary remedial alternative identified is excavation of the source material and disposal at a permitted hazarduos waste landfill facility. The landfill facility could either be constructed on-site or an off site facility could be utilized.

The remedial alternatives identified above are not intended to be mutually exclusive and some combination of all alternatives identified herein and in subsequent phases of the project could be utilized as the selected remedial alternative.

3.1.2 Central Shoulder

The central shoulder portion of the site is of primary concern in that buried drums occur at this location and therefore, the potential for groundwater contamination exists. The remedial alternatives identified consist of the following:

- No action
- Source isolation
- Rendering the source nonhazardous

- o Recycling
- o Source excavation and disposal

The source isolation alterantive for the central shoulder area would be basically the same type of containment methods detailed for the buried lagoon area.

Rendering the source nonhazardous at the central shoulder area would again be basically the same as outlined for the buried lagoon area. It is anticipated that a combination of in-situ treatment, excavation, incineration and/or chemical or physical treatment of the wastes would be required.

Recycling of the liquid substances contained in the drums could be a remedial alternative. This alternative could be utilized in conjunction with the other remedial alternatives identified herein.

The source excavation and disposal remedial alternative would basically be the same as those methods identified for the buried lagoon area.

As noted previously, some combination of the remedial alternatives identified herein and those alternatives identified in subsequent phases of the project could be utilized as the selected remedial alternatives.

3.1.3 Groundwater Contamination

The remedial alternatives available for areas in which groundwater contamination has occured include:

- o No action
- o Monitoring of contaminant migration
- o Containment
- o In-situ treatment
- o Recovery and treatment

Monitoring the contaminant migration would consist of the placement of monitoring wells and sampling and analysis to determine groundwater quality change over time. This remedial alternative could be utilized initially and subsequent implementation of other remedial alternatives identified below if required.

Containment of the groundwater contamination would essentially consists of the methods identified for the source isolation remedial alternative for the lagoon area.

In-situ treatment of the groundwater contamination to immobilize, reduce or eliminate the contaminants could be utilized. This remedial alternative could be implemented by using physical, chemical and/or biological techniques.

Recovery and treatment of groundwater contamination could be utilized as a remedial alternative. This alternative would include installation of recovery wells, pumping of these wells, treatment of the recovered water, if required, and discharge of the treated water to surface waters and/or injection into the same aquifer as a form of artificial recharge.

As before, some combination of the remedial alternatives identified herein and those alternatives identified in subsequent phases of the project could be utilized as the selected remedial alternative.

3.2 PERFORMANCE CRITERIA AND STANDARDS FOR REMEDIAL TECHNOLOGIES

Six criteria will be used as the basis for evaluating remedial action strategies. These criteria provide a consistent basis for comparison, evaluation, and screening of each alternative, and when used in conjunction with the objectives of the overall work assignment, prove to be effective criteria for selecting a feasible, implementable, and cost-effective remedial action alternative. These criteria include:

- Environmental criteria based on protecting environmental media including groundwater quality and reducing long-term hazards. Secondary environmental effects of implementation will be considered.

- Technical criteria, including technical risks, acceptable and proven technology, technical effectiveness, service life, commercial availability, etc.

- Implementation criteria constructability, project schedule including equipment procurement, field operations, etc.

- Institutional criteria such as permit requirements, regulatory agency acceptance, operational and maintenance requirements, and government infrastructure requirements.

- Environmental and Public Health Standards such as groundwater quality standards, surface water quality standards, toxicity data, etc.

- o Cost criteria based on estimated total cost and cost-benefit analysis in meeting environmental objectives.

Performance criteria will be based on cleanup to background standards. When it is technologically unfeasible to obtain background levels, an alternative would be utilization of existing standards or consideration of human health risk.

3.3 APPROACH TO ALTERNATIVE EVALUATION

The factors elected for evaluation and screening of the technologies have been identified on the basis of performance criteria and available standards. In addition, other factors, including cost, technical feasibility, and time required for implementation will be considered. The factors to be used for comparison of the remedial technologies during the screening and evaluation processes are listed below:

3.3.1 Technical Feasibility

The technical feasibility will be evaluated based on the following criteria:

- o Proven technology - Has the technology been successfully applied in a similar remedial action project?
- o Reliability - Is the technology dependable; can equipment be expected to operate with a minimum of downtime?
- o Operability - Is the technology simple to operate; Can it be practically operated under the site field conditions?
- o Flexibility - Will the technology operate efficiently under variable conditions (i.e., safety constraints required by nature of the contaminated soils or varying hydraulic loadings for a groundwater treatment system)?
- o Equipment availability - Is the equipment commercially and readily available for field application or can a long delivery time be expected?
- o Susceptibility to toxic contaminants - Is the technology subject to upset due to the presence of toxic constituents (i.e., soil and groundwater treatment processes)?

3.3.2 Cost Effectiveness

The appropriate extent of remedy shall be determined by the selection of the remedial alternative which the EPA determines is cost-effective (i.e. the lowest cost alternative that is technologically feasible and reliable and which effectively mitigates and minimizes damage to and provides adequate protection of public health, welfare, or the environment). In evaluating the cost-effectiveness of various remedial technologies, costs for each alternative will be identified by taking into consideration capital and investment costs, labor/expenses, operating costs, and any long-term maintenance costs. A present worth method, approved by EPA, will be utilized for cost comparison purposes.

3.3.3 Institutional Factors

The institutional factors that will be considered in the evaluation of remedial action technologies include:

- Acceptability by Federal and state regulatory agencies.
- Safety (i.e. on-site and off site requirements during implementation of the technologies).
- Public acceptance.
- Permits and licenses (i.e. air or water discharge permits; construction or operations permits).
- Long-term land use.
- Long-term management agency requirements.

3.3.4 Environmental and Public Health Factors

The purpose of remedial action at the site is to rectify any existing and potential future environmental effects and mitigate conditions that could potentially affect public health in the area. Therefore, the ability of a remedial alternative to mitigate/eliminate these impacts is important. Remedial technologies will be evaluated considering their ability to:

- Prevent human access or possible contact with the contaminated materials after site work is completed.
- Abate/minimize existing and potential future groundwater migration and contamination.

- o Minimize any potential additional impacts during remedial action operations on air, land, surface water, and groundwater.
- o Minimize any potential adverse impacts on human health, wildlife and vegetation, neighboring properties, and other sensitive population.
- o Abate/minimize existing and potential future migration and contamination of air, soils, and surface waters.

3.3.5 Time Required For Implementation

The required implementation time for any remedial action alternative will ultimately effect its costs. The favored technologies will optimize the implementation schedule and minimize long-term monitoring/maintenance work.

3.4 IDENTIFICATION OF DATA REQUIREMENTS

The review of the information provided concerning the Skinner Landfill has shown that a very limited amount of site specific data is available. In order to fill the gaps in the available data the following information is needed.

1. On-site geologic information is needed, such as:
   a. Stratigraphy at the site determined by boreholes extending into bedrock.
   b. Characterization of geotechnical, hydrological, and geologic parameters of the soils and sediments on site.
   c. Definition of the water table or potentiometric surface.
   d. Definition of physical soil properties such as the permeability, cation exchange capacity, grain site distribution, etc.
2. Specific information concerning the types and quantities of hazardous materials disposed of at the buried lagoon and central shoulder.
3. More detailed characterization of the waste contained in the drums and their compatibilities.
4. Detailed data concerning the extent of migration of hazardous materials.

5. Configuration and geomorphology of the buried lagoon.

6. The degree and concentrations to which soils, groundwater, and surface water are contaminated.

7. Detailed information concerning the potential receptors. Specifically, a survey of public water supplies in the site vicinity should be conducted to determine those residents that use groundwater for potable water.

3.5 REMEDIAL INVESTIGATION/FEASIBILITY STUDY OBJECTIVES

The objectives of the RI/FS are:

- o Quantify the magnitude and extent of contamination at the site.
  - Identify relationship between current contamination and origin/source.
  - Evaluate remediation technologies consistent with the National Contingency Plan and other regulatory requirements and guidelines.
  - Recommend the remedial action that is technically and environmentally sound, and the most cost effective.
- o Supply the basis for preparing the Record-of-Decision.

Additional specific RI/FS objectives were previously discussed in Section 1.3.

SECTION 4

REMEDIAL INVESTIGATION SCOPE OF WORK

This section of the Work Plan describes the site investigation activities that will be conducted during execution of the project. Various project plans that address specific issues of project execution that require a more detailed treatment than the scope of a typical work plan would include have also been prepared as supporting documents to the Work Plan. The following six plans, having individual scopes as described below, have been or are being prepared. The final Project Operations Plans will be prepared incorporating these individual plans after comments have been received from U.S. EPA and Ohio EPA.

- <u>Health and Safety Plan</u> - prepared on a Site Evaluation Form (SEF); covers personal protective equipment needed depending on location and activity within the site, contingency plans and emergency procedures, field monitoring equipment, and decontamination procedures.

- <u>Quality Assurance Project Plan</u> - covers QA data measurement objectives, sampling objectives and procedures, sample custody, calibration procedures, interval QC checks, QA performance audits, QA reports, preventive maintenance, data assessment procedures, corrective action, and field protocols.

- <u>Sampling and Analysis Plan</u> - covers data collection objectives, sample locations, sample numbering, sampling equipment and procedures, sample analysis and handling, sample documentation and tracking, sampling team organization, and sampling schedule. This is a document to be used <u>in the field</u>, as well as in project planning.

- <u>Site Management Plan</u> - covers project operations at the site including site access and security, site office and decontamination facilities, equipment and materials needs and storage, communications and support functions, and coordination of sampling activities.

- <u>Data Management Plan</u> - covers office procedures for collecting and organizing site investigative data and for controlling its availability, use and distribution.

- Quality Control Plan - covers REM II review procedures for all deliverables. It can not be finalized until U.S. EPA approves the work plan and notice is given to proceed with the project.

In addition to the six plans identified above, a topographic map of the Skinner Landfill has been prepared for utilization in the RI/FS.

The objective of the remedial investigation is to obtain sufficient and valid data which are necessary to determine what response actions, if any, can be considered, evaluated and applied to mitigate the impact posed by the site on public health, welfare and the environment. To accomplish this task, the scope of work for the remedial investigation contains the following thirteen (13) major elements:

- Subcontracting and Mobilization
- Study Area Surveys
- Source Characterization
- Site Characterization
- Bench-Scale Testing
- Data Validation
- Contaminant Pathway and Transport Evaluation
- Endangerment Assessment
- Remedial Investigation Report
- EPA Designated Activities
- Community Relations Support
- Quality Assurance
- Technical and Financial Management

Each of these major elements are discussed in detail below.

4.1 TASK 1 - SUBCONTRACTING AND MOBILIZATION

Prior to initiating the detailed site characterization studies, it will be necessary to establish field support facilities; procure subcontractor services; and identify, obtain and mobilize equipment and materials. As indicated above, a detailed description of these facilities and the required equipment and materials is presented in the Site Management Plan, which is included in the Project Operations Plan. The facilities to be established include an office trailer with secured storage areas for samples and equipment and a telephone; a sheltered equipment decontamination area; a lined, gravel wash-down pad which will drain to a sump for decontamination of the drilling rig; and a fenced, materials storage area. The fenced area will also be used for temporary storage of wastes generated during the RI field work. Equipment and material needs include sampling equipment, decontamination supplies, sample bottles, shipping supplies, disposable personnel protective equipment, field instruments, well construction materials, drums for temporary RI waste storage and documentation supplies. The drilling rig and backhoe would be mobilized the first day needed.

4.2 TASK 2 - STUDY AREA SURVEYS

4.2.1 Subtask 2.1 - Site Boundary Survey

A site property boundary survey will be made in order to accurately define the study boundaries of the Skinner Landfill and the adjacent properties. The survey data will be utilized to prepare site maps, locate soil sampling points and monitoring well locations, and assist in determining which parties must be contacted to obtain property access permission for on-site investigation activities.

4.2.2 Subtask 2.2 - Grid and Elevation Survey

A grid system will be established on the Skinner Landfill study site to allow accurate siting of sampling points and geophysical survey lines, waste disposal and contaminated areas, and monitoring well locations. Site (ground) elevation data will be collected in order to set monitoring well and staff gage elevations. The elevation data may also eventually be used to establish initial ground control elevations during site remediation activities and to estimate soil quantities for cut/fill calculations.

4.2.3 Subtask 2.3 - Groundwater Utilization Survey

A survey of public and private water supply wells within a one-half mile radius of the Skinner Landfill site will be conducted at the ODNR in Columbus, OH. The objectives of the survey include:

- Identify the number, type and location of water supply wells in the vicinity of the Skinner Landfill site.
- Determine the aquifers utilized by water supply wells.
- Determine which wells should be samples as part of the remedial investigation work.

The information compiled during the survey will also be used in conjunction with the groundwater sampling data to evaluate the magnitude and extent of any groundwater contamination in the area.

4.2.4 Subtask 2.4 - Geophysical Surveys

Geophysical methods will be applied in selected areas of the site to gather information on the potential extent of drum disposal and contaminant migration. Geophysical surveys to be utilized will include the following:

o Ground Penetrating Radar (GPR)

GPR will be utilized to evaluate the presence of crushed drums in the subsurface and the configuration of the lagoon base. This information will assist in the evaluation of potential volumes of contaminated soil and wastes contained in the lagoon and aid in selection of subsequent boring locations. Five transects across the lagoon will be performed, one along the axis and four across the axis. It is estimated these transects encompass 500 linear feet.

GPR will also be utilized in the central shoulder area to assess the potential for buried drums and their extent. Grid lines will be laid with a 50-foot spacing in two directions along which the survey will be performed. It is estimated these transects encompass 3800 linear feet.

o Magnetometer

A flux-gate magnetometer will be utilized to supplement the GPR surveys in assessing the potential presence of buried drums. Magnetometer readings will be taken every 25 feet along the previously established GPR transects and observed anomalies will be used to supplement interpretation of the GPR signals. It is estimated 160 magnetometer data points will be collected.

o Electromagnetic Conductivity (EM)

EM will be employed to evaluate the potential existence of contaminant plumes in the shallow subsurface (within 30 feet of surface) adjacent to suspected source areas, including the lagoon and central shoulder areas. EM readings will be taken at 25 foot intervals in 3 transects around the lagoon area (estimated 80 data points) and 4 transects around the central shoulder area (estimated 175 data points). The occurrance of EM conductivity anomalies will be utilized to assist in locating monitoring wells as part of the site characterization, Task 4.

o Seismic Refraction

Seismic methods will be utilized to collect information on the depth to bedrock to supplement data collected during the soil borings. The information will be used to evaluate soil depths and bedrock topography as it relates to the potential for contaminants to enter bedrock aquifers and/or control contaminant movement. The seismic surveys will be performed at 12 locations, 2 of which will be adjacent to borings with known bedrock depths to establish bedrock and soil velocities. The seismic survey locations will be selected on the basis of inaccessibility of on-site surface water bodies, and subsurface conditions, are not well defined. Knowledge of on-site stratigraphy is limited, indicating only that there is glacial drift of varying thickness and character overlying interbedded shales and dolomites. It is anticipated that the bedrock surface is an important hydrogeologic feature.

Although there is evidence that groundwater southeast of the buried lagoon is contaminated with a variety of organic chemicals, the presence and extent of contamination in other parts of the site is not known. Of particular interest in this respect are the potential source areas in the Central Shoulder and Landfill investigation areas. (Due to the nature of the demolition debris in the landfill, test applicable to characterization of that area as a potential source of hazardous contaminants. Thus indirect characterization through groundwater and surface water sampling is being used).

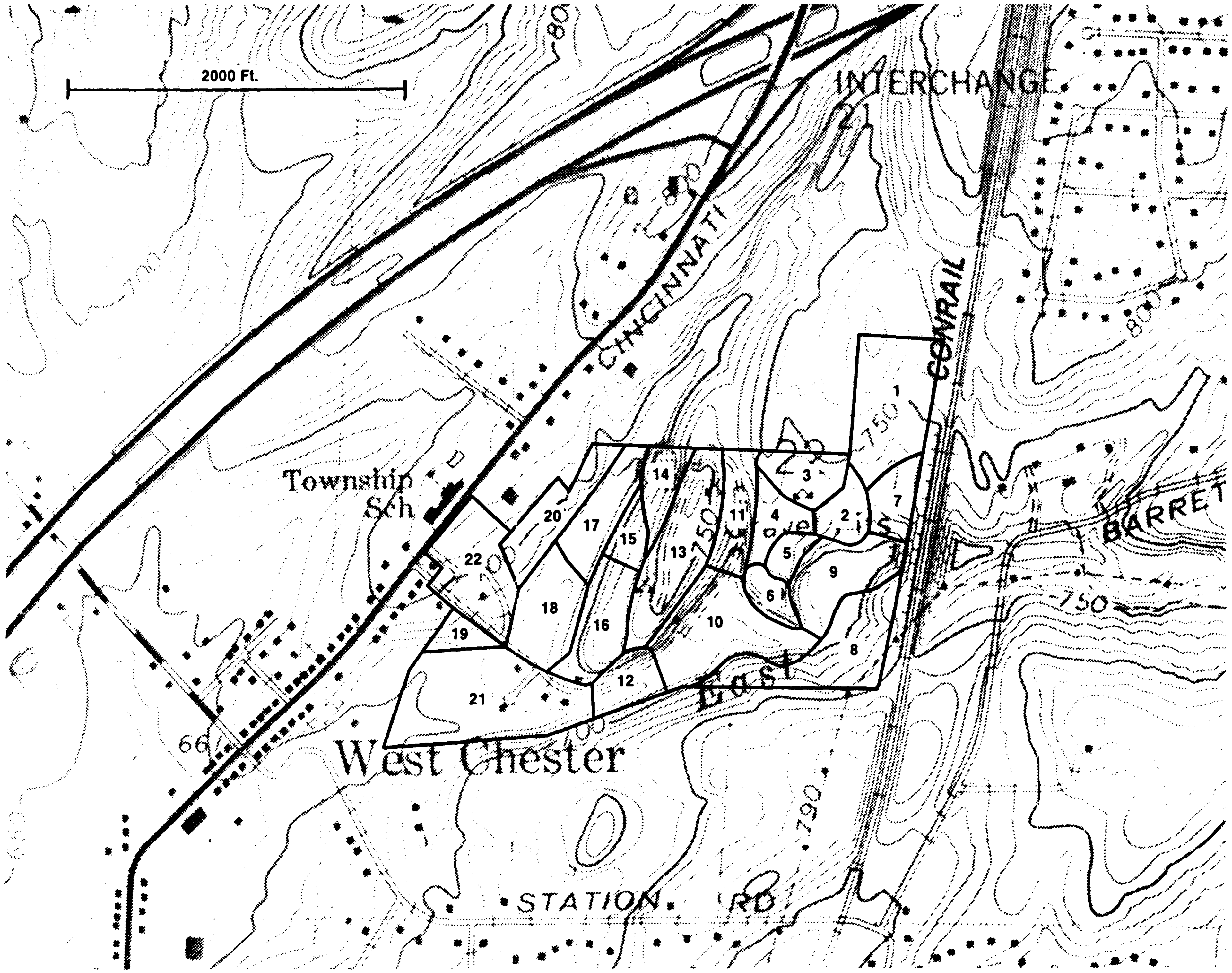
To address the related data needs for characterizing the groundwater migration pathway and the nature and extent of groundwater contamination, a total of 30 monitoring wells will be installed at 23 separate locations. Seven locations will have two-well nests consisting of one water table well at an estimated depth of about 20 feet and one piezometer screened in the lower portion in the saturated overburden or in bedrock at a depth of approximately 20 feet below the water table well. Sixteen locations will have single wells screened at the water table, at an estimated depth of about 20 feet each.

Baildown testing will be performed in all wells to measure hydraulic conductivities of the soil and rock formations adjacent to the screened intervals. Two rounds of groundwater samples will be collected from all 30 wells and sampled as specified in Table 4-2. Filtered aliquots for metals analysis will be obtained at all wells. An additional six unfiltered aliquots for metals analysis and determination of total suspended solids will be collected during the first sampling round. The approximate locations of the monitoring wells are shown in Figure 4-3.

1. Two-well Nests

Monitoring well installation will begin at locations having two-well nests. The deep piezometer will be installed first so that the shallower stratigraphy is mostly defined prior to installation of the water table well. The following procedures will be used to install the deep piezometer:

- All equipment, tools and materials will be steam cleaned prior to drilling at each location. Provisions will be made to keep the equipment, tools and materials from coming into contact with surficial soils during drilling and well installation.



Note: See Table 3 for designations of investigation areas.

FIGURE 2-1 INVESTIGATION AREAS - SKINNER LANDFILL

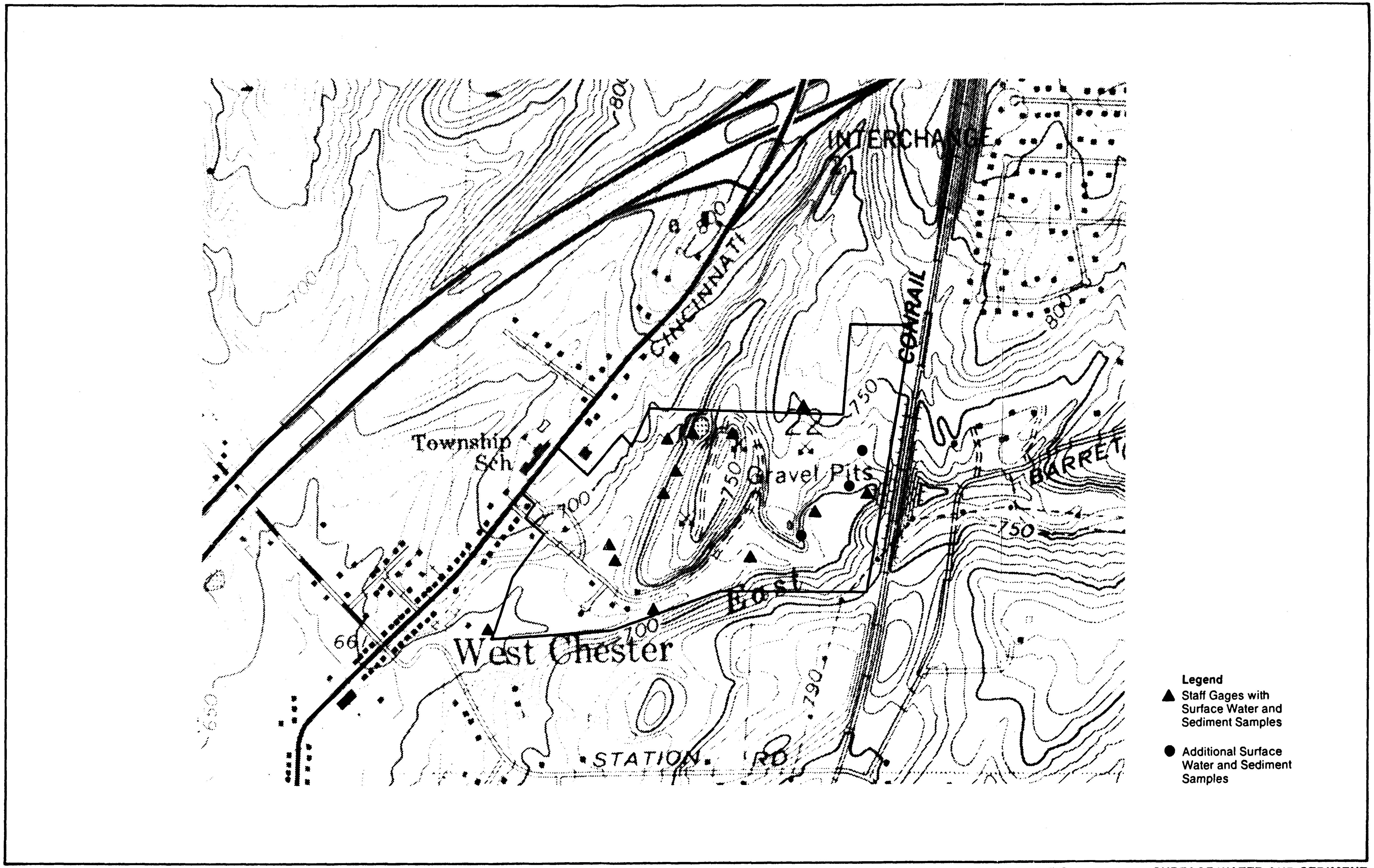


FIGURE 4-6 SURFACE WATER AND SEDIMENT SAMPLE LOCATIONS

- The borehole will be advanced through overburden soils using hollow stem augers (6-inch ID), cable-tool methods (4-inch casing) or other technique approved by the geologist that does not use drilling fluids.

- Soil samples will be collected using standard split-spoon and Shelby tube samplers. Samplers will be collected continuously (every 18 inches) to a depth of 15 feet, at 2.5 foot intervals to the bottom of the boring. As each sample is recovered, it will be qualitatively screened for organic logged by a geologist or geotechical engineer and the geotechnical index testing.

- Soil drilling and sampling will proceed until the borehole has encountered both auger/casing and split-spoon refusal. If hollow stem augers are being used, casing will be telescoped through the augers and seated into the bottom of the borehole. Two five-foot rock coring runs will then be attempted. The core will be logged by the geologist and retained in a wooden core box for future reference.

- If the water table has not been encountered in the drift, continuous coring of soil will proceed to a depth of 20 feet below the water table as encountered in the rock.

- The borehole will be backfilled with a mixture of compressed bentonite pellets and sand to the depth selected for the bottom of the screen.

- At locations where there is little or no suspected contamination, the well will be constructed out of 2-inch diameter, Schedule 40 PVC with flush-threaded couplings and a five-foot screened interval at the bottom. In areas suspected of having moderate to high levels of organic contamination (ten areas), low carbon steel will be substituted for the PVC riser and stainless steel will be substituted for the PVC screen. The screen will be factory mill-slotted or continuously slotted with openings of 0.010 inches. No glues or solvents will be used.

For purposes of estimating costs, it is assumed 3 piezometers and 9 water table wells will be constructed of steel materials.

- The annular space around the screen will be backfilled with a silt-free flint sand to a height at least two feet above the top of the screen. A two-foot seal of compressed bentonite pellets will be placed above the sand pack, and the remaining annular space will be filled with a cement-bentonite grout placed with a tremie pipe.

- A four-inch diameter, locking protective casing will be installed at the surface with a concrete anchor and runoff diversion apron. The riser will be covered with a loosely fitting, vented cap. Locks will be provided. Three vehicle-bumper posts will be installed around the well if it is in a traffic area.

- The well will be developed by surging and pumping until five well volumes have been removed and clear water is obtained during pumping. Upon completion of development, a bail-down recovery test will be performed to document the sensitivity of the well and provide data for calculating the hydraulic conductivity of the screened interval.

The shallow wells at these locations (two-well nests) will be installed using procedures similar to those described above except that:

- Samples will not be collected.

- The depth of the boring will be at an average of 20 feet or at least 10 feet below the water table whichever is greater.

- The screened interval will be ten feet in length.

- Care will be taken to ensure that the annular space of the well is completely sealed against surface runoff.

The details of well construction for two-well nests are shown in Figure 4-4.

2. Single-Well Installations

Monitoring wells at locations having one well will be installed last using the following procedures:

- All equipment, tools and materials will be steam cleaned prior to drilling at each location. Provisions will be made to keep the equipment, tools and materials from coming into contact with surficial soils during drilling and well installation.

- The borehole will be advanced using hollow stem auger (6-inch ID), cable-tool drilling methods (4-inch casing) or other drilling technique approved by the geologist that does not use drilling fluids.

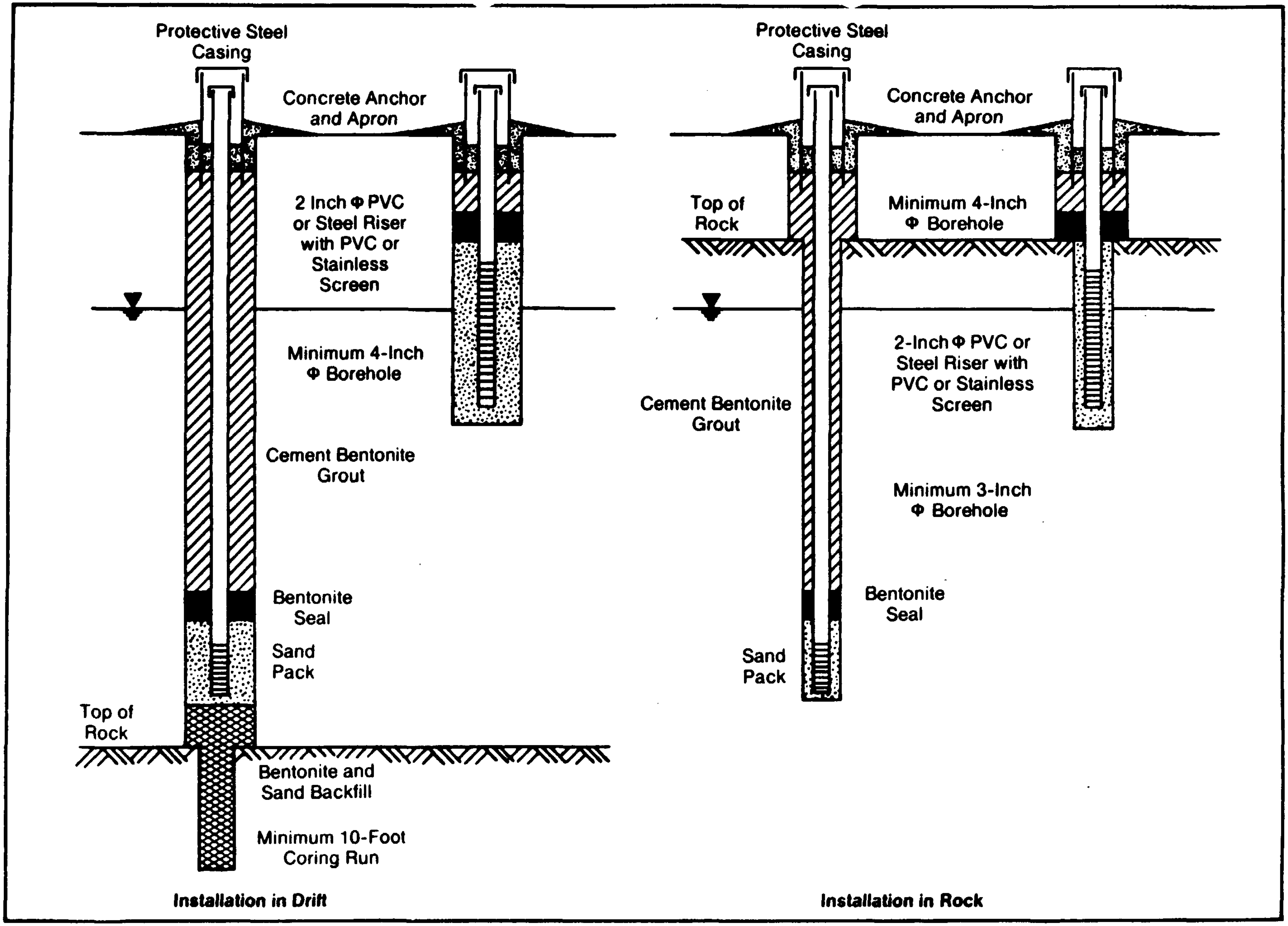


FIGURE 4-4 CONSTRUCTION DETAILS - TWO WELL NESTS

- Soil samples will be collected using standard split-spoon and Shelby tube samplers. Samples will be collected at 2.5 foot intervals to the bottom of the boring. As each sample is recovered, it will be qualitatively screened for organic vapors using OVA and/or HNu instruments. The boring will be logged by a geologist or geotechnical engineer and the samples retained for future reference and possible geotechnical index testing.

- In the eastern half of the site, drilling and sampling will proceed until both auger/casing and split spoon refusal are encountered. If hollow stem augers are being used, casing will be telescoped through the augers and seated into the bottom of the hole. One five foot rock coring run will then be attempted. The core will be logged by the geologist and retained in a wooden core box for future reference.

- In the western part of the site, drilling and sampling will proceed until the borehole has advanced to a depth of 50 feet or 10 feet below the water table, whichever is greater. If rock is encountered at shallower depths, at least five feet, but not more than 10 feet of rock will be cored.

- If the water table has not been encountered in the drift, continuous coring of rock will proceed to a depth of 10 feet below the water table as encountered in the rock.

- The borehole will be backfilled with a mixture of sand and bentonite pellets to the depth selected for the bottom of the screen.

- At locations where there is little or no suspected contamination, the well will be constructed out of 2-inch diameter, Schedule 40 PVC with flush-threaded couplings and a ten-foot screened interval at the bottom. In areas suspected of having moderate to high levels of organic contamination (ten areas), low carbon steel will be substituted for the PVC riser and stainless steel will be substituted for the PVC screen. The screen will be factory mill-slotted or continuously slotted with openings of 0.010 inches. No glues or solvents will be used.

- The annular space around the screen will be backfilled with a silt-free flint sand to a height at least two feet above the top of the screen. A two-foot seal of compressed bentonite pellets will be placed above the sand pack, and the remaining annular space will be filled with a cement-bentonite grout placed with a tremie pipe.

- A four-inch diameter, locking protective casing will be installed at the surface with a concrete anchor and runoff diversion apron. The riser will be covered with a loosely fitting, vented cap. Locks will be provided. Three vehicle bumper posts will be installed around the well if it is in a traffic area.

- The well will be developed by surging and pumping until five well volumes have been removed and clear water is obtained during pumping. Upon completion of development, a bail down recovery test will be performed to provide data for calculating the hydraulic conductivity of the screened interval.

The details of well construction for the single-well installation are shown in Figure 4-5.

4.4.2 Subtask 4.2 - Groundwater Samples

Groundwater samples will be collected from all 30 monitoring wells installed for this investigation. Samples will be collected using the following procedures:

- The depth to the water level in the well will be measured with an electrical sounder or a weighted steel or fiberglass tape. The weight will be designed to create a popping sound on contact with the water surface.

- Based on the water level measurement and the depth of the well, the volume of standing water in the well will be calculated.

- The well will be purged using a positive displacement pump constructed of chemically inert materials. The standard procedure will be to pump until at least three well volumes have been removed.

- Beginning with the second volume, periodic measurements of pH, specific conductance and temperature will be made using the procedures contained in Appendix A.

- Purging may cease when measurements for all three parameters have stabilized ($\pm$0.25 pH units, $\pm$ 50 umhos/cm, and $\pm$ 0.5° C) for three consecutive readings or after five well volumes have been removed.

- If the well pumps dry before three volumes have been removed, the well will be allowed to recharge for 15 minutes and then pumped dry again.

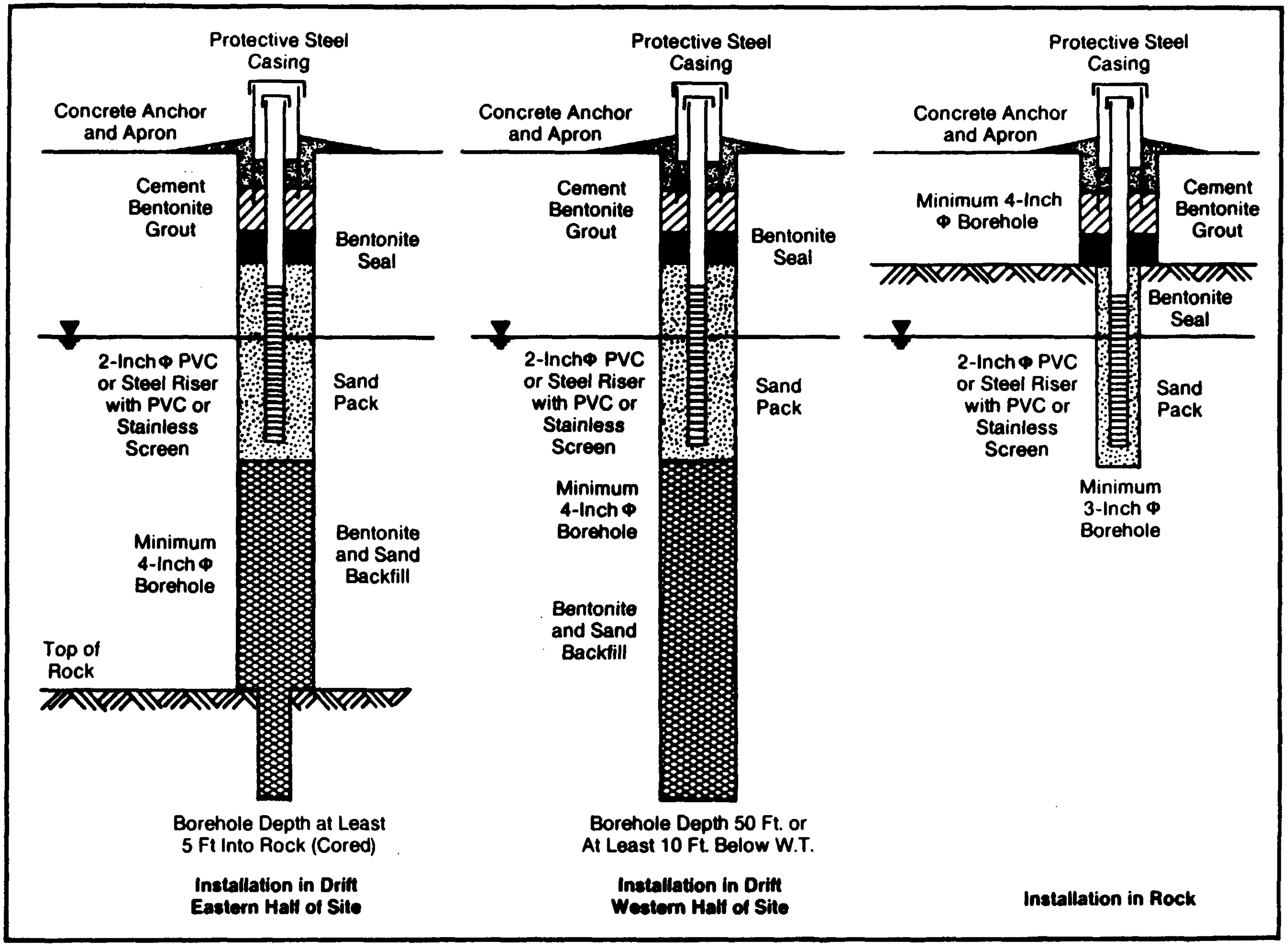


FIGURE 4-5 CONSTRUCTION DETAILS - SINGLE WELL INSTALLATION

- The sample will be obtained with a stainless steel or teflon bailer. The bailer will be raised and lowered in the well using a new length of nylon cord at each location.

- The sampling and purging equipment will be decontaminated in accordance with the standard protocol presented in Table 4-3 prior to each use.

4.4.3 Subtask 4.3. - Private Well Samples

Surveys will be performed to identify sources of potable drinking water and groundwater utilization within one-half mile of the site. Using data collected during these surveys and information concerning local groundwater flow patterns obtain from the newly installed monitoring wells, 10 private wells within one half mile of the site will be selected for sampling and chemical analysis (Refer to Table 4-2 for sampling parameters). To the extent possible, these wells will be representative of upgradient and downgradient positions, the aquifers utilized and have an even geographic distribution.

4.4.4 Subtask 4.4 - Surface Water and Sediment Samples

Surface water draining from the site may contain hazardous contaminants. In addition, contaminated groundwater could be discharging to on-site surface water bodies. Contaminants could also be accumulating on or migrating with related sediments. Samples of surface water and sediment will be collected and analyzed to assess these potential migration pathways (Refer to Table 4-2 for sampling parameters). Sampling locations include five sites along East Fork, two sites along Skinner Creek, six ponds or impoundments on the site, and three locations of leachate seepage. Staff gages will be installed at 13 streams and pond sampling sites. In addition, seven unfiltered samples will be collected from the streams on two separate occasions for characterization of their suspended sediment load. The approximate location of the surface water and sediment sampling are shown in Figure 4-6.

4.4.5 Subtotal 4.5 - Air Sampling

To date, there is very little existing information on the potential ambient air impact of the Skinner site on the surrounding community. Prior to any future on-site activity, it will be necessary to characterize these potential air quality impacts so that remedial activities can be carried out in such a fashion as to minimize their adverse effects.

In order to accomplish this, background information on the current situation must be gathered. The potential air quality impacts relate to the following:

- o Contaminated surface soil particulates (i.e., fugitive dust);
- o Volatile organic emissions from waste material disposal and spill areas;

The first step in gathering the needed data is to conduct a multipoint sampling of the surface particulate on the site. This will provide information concerning the nature and degree of potential airborne particulate contamination. If these analyses indicate that no serious contamination of the surface soils has taken place, future particulate (in air) sampling can be minimized or eliminated. Due to the type of waste previously deposited on site, the potential exists for off-site migration of organic compounds.

Once the information on the particulate analyses is acquired, an assessment of air monitoring requirements can be made. At a minimum, the air monitoring program will consist of Tenax or charcoal tube samples at three points (1 upward and 2 downward) around the site to characterize the volatile emissions. A worst-case situation, in which significantly contaminated surface soils were found in various locations throughout the site, would require both Tenax/charcoal tube samples and particulate samples at multiple points surrounding the downwind boundary of the site. A local windrose will allow determination of upwind and downwind locations, and will be included in the monitoring program that is ultimately utilized.

This information on the potential off-site migration of toxic volatile and particulate emissions would be used to determine concentrations at nearby sensitive receptor locations, such as homes, roadways, and work places, and a risk assessment of these exposures could then be performed. This exercise would satisfactorily classify the background situation at the site.

4.4.6 Subtask 4.6 - Technical Memoranda

Technical memoranda will be prepared upon completion of the site characterization field work to document actual activities and present the findings. Memoranda will be prepared for the following subjects:

- o Sampling and analysis of water supply wells and groundwater; identification of contaminant levels in all three hydrostratigraphic units, investigated evaluation of potential contaminant migration across the site boundary and into the water supply aquifer.

- <u>Hydrogeologic conditions in the study area</u>; identification and characterization of soil stratigraphy and areal relationships of soil deposits; identification and characterization of hydrostratigraphic units and areal relationship; evaluation of groundwater flow systems, flow directions, flow rates and recharge-discharge relationships.

- <u>Sampling and analysis of surface water and sediment</u>; identification of on-site contaminant levels; evaluation of off-site contaminant migration.

4.5 TASK 5 - BENCH/PILOT STUDY

During the development and initial screening of technologies, laboratory and bench scale studies may be needed to determine the overall implementability, operability, reliability and cost effectiveness of a particular alternative.

Laboratory studies or pilot scale studies or supplement studies that may be needed to determine engineering design and operating criteria for full-scale operation of the chosen technologies are discussed below. If the laboratory studies are deemed necessary based on work activities, a separate work plan, schedule and budget will be developed for OEPA and U.S. EPA approval. This work plan will be submitted in a time frame that maintains steady progress of the overall feasibility study.

4.5.1 Subtask 5.1 - Treatability Studies

Treatability investigations that may be required include:

- Waste fixation technologies to ensure that encapsulation alternatives will effectively provide containment of the wastes on the site.

- Treatability with a physical/chemical or biological process to determine loading effectiveness, required sizing, chemical and other material requirements for groundwater and/or storm water runoff from the site.

- Incineration pilot studies to determine contaminant destruction efficiencies, design criteria, materials handling requirements and sidestream (i.e., off gases and ash) treatment/handling/disposal requirements.

4.5.2 Subtask 5.2 - Compatibility Studies

One remedial action technology that will be considered is the use of contaminant migration barrier walls (slurry walls). The compatibility of soil bentonite walls and waste material deposited on the Skinner site and leachate being generated on the site will have to be investigated

4.5.3 Subtask 5.3 - Groundwater Modeling/Field Testing

Groundwater modeling to estimate impacts of technologies on groundwater quality after implementation of a remedial action may be required. Pump tests, above and beyond those scheduled in the field, to determine the aquifer characteristics may also be needed to evaluate the effectiveness of pumping and treating groundwater, as well as determining flow and dispersion of contamination plumes. The above activities are not included within the schedule and budget of this work plan.

4.6 TASK 6 - DATA VALIDATION

The objective of this task is to assure that the investigation data compiled are sufficient in quality and quantity to support the feasibility study and to determine whether or not the surface water runoff, groundwater, or contaminated soil at the site present an existing or future hazard to human health or welfare, or to the environment. Data validation also includes independent review and quality assessment of all data. The U.S. EPA, Ohio EPA and the U.S. EPA contract laboratory will be provided an opportunity to conduct independent reviews of the data compiled during the remedial investigation study.

All analytical data will undergo a QA/QC review before final reporting. Data validation and QA/QC is discussed in more detail in the POP, QAPP and Sampling and Analysis Plan.

4.7 TASK 7 - CONTAMINANT PATHWAY AND TRANSPORT EVALUATION

This task involves the evaluation of contaminant transport pathways to define the environmental and health consequences of the site contamination problem. The evaluation will then be utilized in analyzing alternative remedial approaches at the site as part of the feasibility studies. The pathways that will be investigated include soil (unsaturated zone), groundwater, surface water and air.

4.7.1 Subtask 7.1 - Unsaturated Soil Zone

Numerous soil samples will be collected during the on-site remedial investigation. The soil sampling survey is described in detail in the Sampling and Analysis Plan (Document No. 130-WP1-QA) and summarized in Section 4.3 (RI Task 3 - Source Characterization) of this Work Plan. The type of information that will be collected during the soil survey and subsequently used to evaluate contaminant pathways and transport vehicles includes the following:

- o the type of contaminants present

- o the extent of contamination (i.e., delineation of contaminant plumes)
- o contaminant solubilities
- o contaminant densities
- o contaminant amenability to soil absorption/adsorption
- o volatility of contaminants

This type of information will allow a determination to be made concerning what directions (i.e., pathways) contaminants are migrating from various disposal locations on the Skinner site, whether the contaminants are being transported through the unsaturated soil zone into the groundwater or being attenuated in the soil, and whether the contaminants could migrate through the unsaturated soil zone as a gas.

4.7.2 Subtask 7.2 - Groundwater

Groundwater sampling will also be conducted during the on-site remedial investigation work. Information from the groundwater sampling survey will allow delineation of the type and extent of groundwater contamination present. Specific contaminant characteristics, such as solubility and density in conjunction with hydrogeologic data, such as soil hydrologic conductivity and transmissivity, will allow determination of such items as:

- o Projected direction and rate of contaminant transport in the groundwater;
- o Estimated volume of contaminated water (and contaminants) present;
- o Determination of whether contaminants would collect at the interface of the aquifer surface and the unsaturated soil zone or settle through the aquifer and become concentrated along the surface of the underlying bedrock (or even seep into the fractured bedrock);
- o Whether contaminants would be dissolved (solubilize) in rainwater as it percolated through the soil and be leached out and subsequently transported into the underlying aquifer.

4.7.3 Subtask 7.3 - Surface Water

Surface water sampling will also be conducted during the remedial investigation task. This will allow determination if off-site migration of contaminants is occurring via transport bysurface waters (or groundwater recharge of surface streams). This could be occurring via one of the following pathways:

- o Recharge of surface streams with contaminated groundwater;
- o Contaminated stormwater runoff from the Skinner site;
- o Discharge of contaminants at ponds which borders the west side of the Skinner site.

4.7.4 Subtask 7.4 - Air

The initial planned on-site activity includes drilling test wells and excavating soil test pits. In order to measure the potential volatile emissions from these wells and test pits an air monitoring program will be implemented. Real-time safety-related air sampling instruments will be utilized as part of the site safety plan. In addition, during the excavation of soil test pits, a continuous downward Tenax/charcoal tube will be used to determine the emissions from this operation. This information can then be combined with the background risk assessment efforts to determine the additional impacts of the on-site activities. Future air monitoring requirements will depend on the results of the first two phases of the program just described, the outcome of the risk assessment effort, and the type of remedial action planned for the site.

4.8 TASK 8 - ENDANGERMENT ASSESSMENT

An Endangerment Assessment (EA) will be conducted to establish the extent to which contaminants present at the Skinner Landfill site may present a danger to the public health, welfare, or the environment. This EA will evaluate conditions at the site in the absence of any further remedial actions, i.e., it will constitute as assessment of the "No-Action" remedial alternative. The assessment will be in accordance with procedures and parameters developed by EPA.

The EA will consist of the following five steps:

- o Selection of contaminants of concern (indicator chemicals)
- o Identification of pathways
- o Estimation of concentrations of chemicals at exposure points
- o Comparison of projected concentrations to relevant/ applicable standards
- o Quantification of risk

4.8.1 Subtask 8.1 - Selection of Indicator Chemicals

The first task in the indicator chemical selection process will be a review of environmental monitoring data and other site information. Each chemical detected at the site above local background levels will be considered. Several categories of hazardous chemicals have been found at the Skinner Landfill. These include volatile organic compounds, pesticides and heavy metals. Several of these organic compounds (for example benzene and chloroform) have been associated with several chronic health effects including carcinogenicity. These compounds and some of the heavy metals are likely to be chosen as indicator chemicals. Any other chemicals found in environmental media as the Remedial Investigation proceeds will also be considered for selection. The two most important factors used in selecting indicator chemicals from these will be concentation and toxicity. Additional factors that will be considered include physical and chemical parameters related to environmental mobility and persistence.

The indicator chemicals selected for the no-action alternative will be reviewed later for applicability to the remedial alternatives. Because of concerns over treatability, additional chemicals may need to be assess in these analyses.

4.8.2 Subtask 8.2 - Identification of Exposure Pathways

An exposure pathway is defined by four elements: (1) a source and mechanism of chemical release to the environment, (2) an environmental transport medium (e.g., air, groundwater) for the released chemical, (3) a point of potential contact with contaminated medium (the exposure point), and (4) an exposure route (e.g., drinking water ingestion) at the contact point. In some cases an exposure pathway may involve more than one environmental transport medium.

To identify possible exposure pathways, activity patterns near the site will be qualitatively defined and combined with chemical release source and transport media information.

The principal release sources at the Skinner Landfill site are the wastes that have been disposed of there. The principal transport media for the released chemicals are likely to be groundwater and surface water. Current information does not indicate that air is a significant transport medium.

For each combination of release source and transport medium, the location of highest individual exposure to the general public will be identified. The number of people and biota potentially affected at each of the significant exposure points will also be determined. both short-term and long-term exposures will be considered.

Although the limited off-site sampling to date has not shown contamination there are several populations that could be potentially affected by off-site migration. These populations include nearby residents that use well water, aquatic life in East Fork Creek and Skinner Creek and any populations eating fish from these and related surface water bodies. If during the Remedial Investigation air contamination is shown to be significant, such exposures to residents living adjacent to the landfill will need to be considered.

From the information developed in the previous steps, complete exposure pathways that exist for the site will be identified. The risk estimates developed later in this assessment will be determined at exposure point locations. In cases where exposures via identified pathways are nonquantifiable, they will be noted in a discussion of uncertainties of the assessment.

4.8.3 Subtask 8.3 - Estimation of Exposure Point Concentrations

After potential exposure pathways have been determined, environmental concentrations for each indicator chemical will be estimated at each of the exposure point locations. Concentrations of substances will be estimated as a function of time (i.e., short-term and long-term) in each environmental medium--air, surface water, groundwater, or soil—through which potential exposures could occur.

To assess the potential adverse health effects associated with a site, the amount of human exposure to the selected contaminants must be determined. Intakes of exposed populations will be calculated separately for all reasonable pathways of exposure to chemical contaminants in each environmental medium—air, groundwater, surface water, and soil. Then, for each population-at-risk, the total intake by each route of exposure will be calculated by adding the intakes from each pathway. Total oral and inhalation exposures and (if determined to be important) dermal exposure will be estimated separately.

Because short-term (subchronic) exposures to relatively high concentrations of chemical contaminants may cause different toxic effects from those caused by long-term (chronic) exposures to lower concentrations, two intake levels may be calculated for each route of exposure to each chemical, i.e., a subchronic daily intake (SDI) and a chronic daily intake (CDI). These calculated intakes will be based on the short-term and long-term concentrations derived for each chemical in the exposure assessment, in combination with information on human activities that lead to exposure.

Critical toxicity values (i.e., numerical values derived from dose-response information for individual compounds) will be used in conjunction with the results of the human exposure assessment to characterize risk. Where health effects assessments (HEAs) have been developed by EPA's Office of Research and Development, these will be used as a source of critical toxicity values. This may require interpretation of the applicability of toxicity data to the specific exposure conditions projected to occur at the site.

Four different types of critical toxicity values may be used:

- The acceptable daily intake for subchronic exposure (AIS);
- The acceptable intake for chronic exposure (AIC);
- The carcinogenic potency factor (for carcinogens only); and
- Daily intake levels for intermittent exposures.

The AIS and AIC values and other daily intake levels will be derived by applying safety factors to no-observed effect levels from animal studies and/or epidemiological studies and represent levels of exposure below which adverse health effects are unlikely to occur. The carcinogenic potency factor, defined as the slope of a calculated dose-response curve, will be used to estimate cancer risks at low dose levels. This factor is estimated from the upper 95% confidence limit of the slope of the dose-response curve derived from a linearized extrapolation model.

1. Potential Carcinogens

For the potential carcinogens, risk will be directly related to intake at low levels of exposure. Expressed as an equation, the model for a particular exposure route is:

$$\text{Risk} = \text{CDI} \times \text{Carcinogenic Potency Factor}$$

This equation is valid only for risks below 10^{-2} because of the assumption of low-dose linearity. For the sites where this model estimates carcinogenic risks of 10^{-2} or higher, an alternative model may be considered. EPA headquarters will be consulted for guidance on an appropriate model.

It will also be assumed that cancer risks from various exposure routes are additive. The total carcinogenic risk for a site will then be estimated by:

$$\text{Total Risk} = \text{Carcinogenic Risk for } (\text{Chemical}_1 + \ldots + \text{Chemical}_N)$$

unless information is available that suggests antagonism or synergism. Thus, the result of the assessment will be an upper 95% confidence level of the total carcinogenic risk for each significant exposure point.

2. Noncarcinogenic Risks

To assess noncarcinogenic risks the SDI will be compared to the AIS and the CDI is compared to the AIC. In any case where the SDI exceeds the AIS or the CDI exceeds the AIC, an unacceptable public health risk will be assumed to exist. Where there are exposures to more than one chemical compounds, a hazards index developed by EPA will be used. This index sums the ratios of the SDI to the AIS or the ratios of the CDI to the AIC over all the chemicals present. This assumes that the risks due to exposure to multiple chemicals are additive. This assumption is probably valid for compounds which have the same target organ or cause the same effect. If the hazard index results in a value greater than unity, the compounds in the mixture will be separated by critical effect and separate hazard indices derived for each effect.

If any chemicals with teratogen ic effects are being assessed, a separate subchronic hazard index will be calculated for them using the AIS for teratogenic effects.

Throughout this entire risk assessment process, intakes and risks from oral and inhalation exposure pathways will be estimated separately using route specific data on potency and toxic effects. However, the possible effects of multimedia exposure will be evaluated by summing the hazard indices for inhalation and oral exposures at each significant exposure point. This will ensure that acceptable levels are not being exceeded by combined intakes when multiple exposure pathways exist.

4.9 TASK 9 - REMEDIAL INVESTIGATION REPORT

4.9.1 Subtask 9.1 - Draft RI Report

After consultation with U.S. EPA and OEPA, a draft remedial investigation report will be prepared to consolidate and summarize the data obtained and documented in previously prepared technical memoranda during the remedial investigation.

In addition to a thorough discussion of the conditions at the site, including characterization of surficial processes, hydrogeologic systems and waste material distribution, the draft report will present:

- o Recommendations regarding whether or not to proceed with the FS.
- o A list of remedial technologies that could be applied to the site.

The draft remedial investigation report will be submitted for review by U.S. EPA and OEPA.

4.9.2 Subtask 9.2 - Agency Review

Two copies (each) of the draft RI report will be submitted to U.S. EPA and OEPA for review. Agency comments will subsequently be incorporated into the document.

Upon completion of agency review, a meeting will be held among the REM II project team, U.S. EPA project staff and representatives of OEPA. The purposes of the meeting are as follows:

- To discuss the contents of the remedial investigation report.
- To determine the remedial action objectives.
- To identify alternative operable units to be addressed in the feasibility study.

A list of operable units will be prepared by the project team prior to the meeting to provide a basis for the discussion.

On the basis of the review meeting, agreement on the remedial technologies to be evaluated in the feasibility study will be summarized in a project memorandum. A public meeting will be held at this time. Community Relations Activities are discussed separately in Section 4.11, Community Relations Support. The scope of the feasibility study, as presented in this work plan, will be reviewed and modified as appropriate to incorporate the results of the review meeting.

4.9.3 Subtask 9.3 - Final Remedial Investigation Report

Following OEPA and U.S. EPA review of the draft RI report and incorporation of agency comments into the document, final copies will be submitted.

4.10 TASK 10 - EPA-DESIGNATED ACTIVITIES

No preliminary designated activities are required for this project.

4.11 TASK 11 - COMMUNITY RELATIONS SUPPORT

The U.S. EPA will assume primary responsibility for community relations activities during the RI/FS Phase of the project. Assistance will be provided by the project team and will be required at regular intervals throughout the RI/FS process. The community relations' role of the project team will be limited to providing advice or assistance to the U.S. EPA when requested to do so. ICF, Inc. will be responsible for supporting U.S. EPA's community relations' program throughout the Remedial Response action.

Based on conversations between U.S. EPA, Region V Public Affairs Office personnel, ICF, Inc., and Weston, the community relations support needed at the Skinner Landfill site has been scoped. The objectives of this support task is to assist U.S. EPA in implementing the existing community relations plan developed for the Skinner Landfill. Community relations implementation support provided by the REM II team will be a two-fold effort:

- Responding to specific task assignments from EPA (e.g., preparing fact sheets and a responsiveness summary); and,
- Providing a range of as yet unspecified support services.

The following tasks reflect conversations between REM II community relations staff and U.S. EPA Region V staff concerning expected contractor support work for the Skinner Landfill:

- Prepare fact sheets to be used at three (3) public meetings to be held on the Skinner site. The public meetings will be held concurrent with the following technical milestones:
  - Start of remedial investigation;
  - Completion of remedial investigation; and,
  - Completion of draft feasibility study.
- General support for the three (3) public meetings will include:
  - Providing advertisements for each of the public meetings in the local newspaper(s); and,
  - Providing a court reporter to record minutes of the public meeting on the draft feasibility study.
- Prepare a community relations responsiveness summary after completion of the public comment period on the draft feasibility study.

- Revise the community relations plan prior to the start of the remedial design phase to account for any changes in community concerns as a result of the selection of a remedial alternative.

4.12 TASK 12 - QUALITY ASSURANCE

Per the REM II Quality Assurance Program Plan, all projects will receive a system audit. This audit will be conducted by the Regional Quality Assurance Coordinator. The objective of the system audit is to ensure that all QC checks are being performed as the project progresses. The system audit schedule is presented in the Quality Assurance Project Plan (QAPP).

4.12.1 Subtask 12.1 - Performance Audits

The REM II Quality Assurance Program Plan stipulates that performance audits be conducted on all enforcement lead projects. Performance audits will be conducted by the NPMO. A performance audit is more rigorous than a system audit and entails an audit team visiting the field to actually observe that proper QC procedures are being followed (rather than just verifying that QC checks are being made and required document QC sign-offs are being made).

4.13 TASK 13 - TECHNICAL AND FINANCIAL MANAGEMENT

Project Administration encompass the following subtasks:

- Technical review and oversight.
- Financial review and oversight.
- Meetings.
- Technical and financial reporting.

Technical review and oversight includes the technical direction and management provided by the Regional Managers and the Site Manager to the site team, from project initiation to completion on topics that are not task-specific.

Financial review and oversight includes the monitoring of budget status, and internal team rebudgeting, as necessary, depending on the level of effort provided by the project team. It also includes monitoring work efforts and forecasting of budget and manpower to schedule the personnel needed for the project.

4.13.1 Subtask 13.1 - Technical Reports

Reporting includes the efforts involved in preparing the required monthly technical and financial progress reports and computer input forms requested by U.S. EPA.

Two types of monthly progress reports are required. These are:

- o Technical Progress Report.
- o Financial Management Report.

Technical Progress Report will include the following:

- o Site identification and activity.
- o Status of work tasks and progress to date with percent of completion defined.
- o Difficulties encountered or anticipated during the reporting period.
- o Actions being taken to resolve problem situations.
- o Key activities to be performed in the next month.
- o Changes in personnel.

The monthly progress report will list target and actual completion dates for each activity, including project completion. The report will also include an explanation of any deviation from the milestones in the work plan schedule.

4.13.2 Subtask 13.2 - Financial Reports

Financial management report will include the following:

- o Actual costs for direct labor, expenses and subcontracts expended each month during the reporting period, including base fee.
- o Cumulative costs and direct labor hours from contact inception to date through the reporting period, including fee.
- o Projection of costs for completing the project, including an explanation of any significant variations from the planned cost.

- Projected versus actual expenditures (plus fee) and a comparison of actual versus planned direct labor hours.

- Projection of costs through completion for both.

Four copies each of the Technical Progress and Financial Management reports will be distributed monthly as follows:

Contract Officer/Project Officer
(EPA Headquarters) - 2 copies
Regional Project Officer - 2 copies

4.13.3 <u>Subtask 13.3 - Document Control</u>

All documents will be filed with proper document numbers according to the guidelines issued by the U.S. EPA.

4.13.4 <u>Subtask 13.4 - Meetings</u>

Monthly meetings, general and management in nature, will be held to provide progress updates on work being completed at the site.

5.0 FEASIBILITY STUDY SCOPE OF WORK

5.1 TASK 1.0 - IDENTIFICATION OF REMEDIAL ALTERNATIVES

5.1.1 Identify General Remedial Response Actions

General response actions that may prove appropriate at this site were identified in Section 3.0 herein. These general response actions were identified in order to determine data gaps to be addressed in RI activities. As the RI progresses, the remedial alternatives will be refined. For each response action, applicable remedial technologies will be identified and technically screened. Screening will be based on "best engineering judgment" with respect to the practicality of implementation. A "no action" alternative will be used as a baseline to measure other alternatives against. Those technologies screened out in this manner will be removed from further consideration.

Based on present knowledge of the site certain generic response actions can be identified including; no action, complete and partial removal, groundwater collection, containment, treatment and disposal. It should be noted that the development of the alternatives will be an ongoing process. We have herein identified several possible general response actions. It must be noted that response actions identified to date are preliminary and as the RI proceeds and additional data are collected the alternatives will be refined.

5.1.2 Identify Remedial Technologies for General Response Actions

Remedial technologies corresponding to each of the identified general response actions will be developed. Remedial actions will be classified according to the types of site problems.

Based on current information, a preliminary array of remedial technologies was developed. It must be emphasized that the list shown below will be greatly refined as the RI phase proceeds.

Leachate and Groundwater Controls

- Capping
  - Synthetic membranes
  - Clay
  - Asphalt
  - Multimedia cap
  - Concrete
  - Chemical sealants/stabilizers

- o Containment barriers

  Function options

  - Downgradient placement
  - Upgradient placement
  - Circumferential placement

  Material and construction options (vertical barriers)

  - Soil-bentonite slurry wall
  - Cement-bentonite slurry wall
  - Vibrating beam
  - Grout curtains
  - Steel sheet piling

  Horizontal barriers (bottom sealing)

  - Block displacement
  - Grout injection

- o Groundwater pumping (generally used with capping and treatment

  Function options

  - Extraction and injection
  - Extraction alone
  - Injection alone

  Equipment and material options

  - Well points
  - Deep wells

  - Suction wells
  - Ejector wells

- o Subsurface collection drains

  - French drains
  - Tile drains
  - Pipe drains (dual media drains)

<u>Surface Water Controls</u>

- o Capping

- o Grading
  - Scarification
  - Tracking
  - Contour furrowing

- o Revegetation
  - Grasses
  - Legumes
  - Shrubs
  - Trees, conifers
  - Trees, hardwoods

- o Diversion and collection systems
  - Dikes and berms
  - Ditches and trenches
  - Terraces and benches
  - Chutes and downpipes
  - Seepage and downpipes
  - Sedimentation basins and ponds

<u>Contaminated Water Supplies</u>

- o In-situ treatment
- o Removal and replacement
- o Alternative drinking water supplies
  - Cisterns or tanks
  - Deeper or upgradient wells
  - Municipal water systems
  - Relocation of intake
- o Individual treatment units

<u>Excavation and Removal of Waste and Soil</u>

- o Excavation and removal
  - Backhoe
  - Cranes and attachments
  - Front end loaders
  - Scrapers
  - Pumps
  - Industrial vacuums

- Drum grapplers
- Forklifts and attachments

o Grading

o Capping

o Revegetation

<u>Removal and Containment of Contaminated Sediments</u>

o Sediment removal

Mechanical dredging

- Clamshell
- Dragline
- Backhoe

Hydraulic dredging

- Plain suction
- Cutterhead
- Dustpan

Pneumatic dredging

- Airlift
- Pneuma
- Oozer

o Sediment turbidity controls and containment

- Curtain barriers
- Coffer dams
- Pneumatic barriers
- Capping

<u>Direct Waste Treatment</u>

o Solids handling and treatment

Dewatering

- Screens, hydraulic classifiers, scalpers
- Centrifuges
- Gravity thickening
- Flocculation, sedimentation

- Belt filter presses
- Filter presses
- Drying or dewatering beds
- Vacuum-assisted drying beds

Treatment

- Neutralization
- Solvent
- Oxidation
- Reduction
- Composting

o Solidification, stabilization or fixation

- Fly ash
- Cement-based
- Lime

5.2 TASK 2.0 - SCREEN REMEDIAL TECHNOLOGIES AND DEVELOP REMEDIAL ALTERNATIVES

5.2.1 Screen Remedial Technologies

The technologies previously identified will be screened based on technical reliability and implementability. The alternatives will be screened by identifying site conditions that will limit or promote the use of the technologies. Site conditions that will be reviewed include waste characteristics, level of technology development, performance record and operation and maintenance. Only those technologies that are not eliminated in this phase of screening will be further screened. Case histories and current literature will be the primary information utilized during this screening phase. Specific site characteristics, such as waste types and site contamination, will be identified to evaluate the reliability and effectiveness of each technology. Examples of site characteristics which would affect effectiveness of a technology would include site configuration, soil texture and permeability, degree of contamination, existing land use, depths of groundwater or plume, etc. Waste characteristics that may affect remedial technology selection would include chemical composition, density, volatility, biodegradability, compatibility with other chemicals and treatability. Those technologies for which the reliability is suspect will be eliminated from further consideration.

5.2.2 Develop Remedial Alternatives

Technologies that pass the preliminary screening will be assembled to develop more specific alternatives. The remedial alternatives will be developed relying on acceptable engineering practices and will emphasize consideration of recycle, reuse, waste minimization and complete destruction options.

The alternatives will include, as a minimum, at least one for each of the following categories:

- Alternatives for treatment or disposal at an off site facility approved by EPA (including RCRA, TSCA, CWA, CAA, MPRSA, and SDWA approved facilities), as appropriate;
- Alternatives which attain applicable and relevant Federal public health or environmental standards;
- As appropriate, alternatives which exceed applicable and relevant public health or environmental standards;
- Alternatives which do not attain applicable or relevant public health or environmental standards but will reduce the likelihood of present or future threat from the hazardous substances. This must include an alternative which closely approaches the level of protection provided by the applicable or relevant standards and meets CERCLA's objective of adequately protecting public health, welfare, and environment;
- A no action alternative.

5.3 TASK 3.0 - SCREEN REMEDIAL ALTERNATIVES BASED ON PUBLIC HEALTH, ENVIRONMENTAL AND COST FACTORS

Remedial alternatives will be screened for environmental and public health impact. Technologies that are eliminated during this screening phase will no longer be considered for further screening. Specific screening criteria for public health, environmental and cost consideration are outlined in subsequent sections.

5.3.1 Public Health and Environmental Screening

The Public Health Evaluation conducted during the RI phase will establish source characteristics (toxicity), transport pathways, receptors and provide an assessment of present or potential public exposure. The Public Health Evaluation will not only provide a means of screening the "No Action Alternative" but will also provide the criteria (e.g. pathways and receptors) that will be used in screening additional alternatives from a public health standpoint. At this stage of screening, alternatives will be deemed adequate if they address all public exposure pathways and receptors.

A focused assessment of the environmental impacts will be performed for each of the remedial technologies which are evaluated in detail. The assessment will address the environmental impacts of these technologies and will identify measures to be taken during the design and implementation of the technology. This environmental assessment will also identify any physical or legal constraints that will impair or affect the ability to implement each of the technologies. Compliance with NPDES, CERCLA, RCRA groundwater protection, corrective action, closure and post-closure requirements, OSHA construction, air contaminant and toxic substances exposure standards, and in particular, the National Contingency Plan, will also be evaluated in this environmental assessment. Other examples of standards and guidance material which will be used when applicable will include the maximum contaminant levels (MCLs) under the Safe Drinking Water Act and the Alternate Concentration Limit (ACL) guidance.

5.3.2 Cost Screening

The remedial action alternatives must not only be technically capable of addressing the environmental concerns, but must also be implemented and operated in a cost-effective manner. Capital costs and operating and maintenance costs will be screened and will reflect site specific conditions.

Capital costs will include such items as disposal costs, engineering expenses, construction expenses, state and local legal fees and startup and shake-down costs. Some of the costs included in operation and maintenance will be operating labor costs, service costs, administrative costs, maintenance reserve and contingency funds. Once costs have been identified and developed, a present worth value will be determined for competing alternatives. The present worth costs will be a screening factor although high cost will not be an eliminating factor without first considering environmental benefits.

5.4 TASK 4.0 - DETAILED TECHNICAL ANALYSIS OF REMEDIAL ALTERNATIVES

5.4.1 Detailed Technical Feasibility Analyses

One of the first concerns in the detailed analyses of alternatives is that suggested technologies are appropriate to site conditions. The evaluation will be conducted using performance, reliability, implementability and safety criteria applied to site conditions. Performance will be assessed by considering both effectiveness and useful life of the chosen alternative. Site-specific conditions and waste characteristics will be important considerations in evaluating performance.

Two factors which will be key to assessing the reliability of a chosen alternate are operation and maintenance requirements, and demonstrated performance. Preference will be given to proven alternatives, especially those which have been proven effective considering waste characteristics and size conditions. Another area of evaluation which will rely heavily on site conditions is constructibility. Time requirements and scheduling are factors considered in this aspect of the evaluation.

Safety will be the fourth factor used in evaluation. The alternatives must address safety of workers, nearby residents and the environment as well as following all guidelines established and maintained by OSHA including construction, general industry, air contaminant and toxic substance exposure standards.

5.4.2 Evaluating Alternatives Versus Institutional Requirements

Institutional factors must be considered in the evaluation and selection of the remedial action strategy. The range of institutional requirements are dependent on the site and waste characterization. The primary requirements will be the hazardous waste regulations (RCRA Subtitle C, 40 CFR, Part 264) which will outline cap, groundwater, and closure requirements. The Maximum Contaminant Levels for drinking water sources will be regulated by the Office of Water. EPA Groundwater Protection Strategy (GWPS) and Alternate Concentration Limits (ACL) will be used as guidelines in establishing a groundwater protection program. It should be understood that GWPS is not considered a document of applicable standards but is being considered for future regulatory amendments. Other federal requirements; including OSHA DOT hazardous materials transport rules; state requirements and U.S.EPA RCRA guidance documents will also be used to ensure the remedial action strategy considers the appropriate institutional factors in the evaluation.

5.4.3 Detailed Public Health Analysis of Alternatives

Protection of health, welfare and environment must be considered in the screening of Remedial Alternatives. The health analysis will be conducted by initially preparing a baseline site evaluation of available relevant data which will include site background data, disposal history, remedial alternatives and site environmental data. The data of particular importance is that which is used to define the type of removal alternatives considered. Due to known contamination of the groundwater, source control options will be considered as an alternative. The following criteria must be met to consider the source control option:

- o The known and suspected chemical contamination at the site is restricted to near its original location.

- o The remedial alternatives considered include both on-site control measures, and removal and off-site disposal or treatment at a facility approved under the Resource Conservation and Recovery Act (RCRA) or other environmental laws including TSCA, CWA, CAA, MPRSA or SDWA, as appropriate.

- o The remedial alternatives will prevent or minimize releases of contaminants.

An exposure assessment will be developed for the site meeting a minimum requirement of evaluation of types, amounts and concentrations of the chemicals at the site, their toxic effects, and potential for exposure. When considering the source control options further documentation must be established.

This documentation will include:

- o Identifying chemicals present at the site and selecting indicator chemicals (based on toxicity, persistence, mobility, and quantity present)

- o Identifying points of potential human exposure and exposure pathways for each remedial alternative considered

- o Characterizing populations potentially at risk

- o Estimating at key exposure points the environmental concentrations of each indicator substance.

Following completion of the exposure assessment the alternatives will be compared to relevant environmental standards. The standards have been developed using a variety of assumptions which do not consistently match specific site conditions. Before a reliable assessment can be performed the underlying assumptions will be reviewed and compared with actual site conditions.

A summary of the public health evaluation will be completed for each alternative. Key technical and exposure issues will be addressed and discussed in the summary.

Key issues include:

A. Technical issues

1. What technologies will minimize or prevent exposures otherwise expected at the site?

2. What chemical releases will be minimized or prevented by the remedial action?

3. What chemical releases will not be minimized or prevented?

4. Over what period will chemical concentrations be reduced at receptor locations, e.g., on-site, at drinking water intakes, in ambient air, etc.?

B. Exposure issues

1. What exposure is expected during the remedial action?

2. What exposure is expected after the remedial action?

3. What relevant and applicable standards will be met/not met?

4. What other criteria, guidance or advisories will be met?

5. What adjustments were made to standards, criteria, advisories, or guidance?

5.4.4 <u>Detailed Evaluation of Environmental Impacts</u>

A major concern in developing and evaluating response alternatives is adequate remediation and protection of the environment. An environmental assessment will be prepared including, at a minimum, discussion of the "no-action" alternative. This discussion will identify potential impacts on the environment, determine value of contaminated areas or potentially contaminated areas, and assess the general significance of the impacts.

The level of detail used in the environmental assessment for each remedial alternative will vary. The general factors of the assessment will consider:

- Effect on environmentally sensitive areas
- Violation of environmental standards
- Short- and long-term effects on the environment

- o Irreversible commitments of resources.

Beneficial effects of the remedial response alternatives to be considered will include changes in the concentration of contaminants in the environment for individual contaminants; the ability of the alternative to improve the biological environment; and improvements in the commercial, residential, recreational, esthetic and cultural resources that were damaged or threatened by site conditions. The alternatives will also be studied to define adverse effects of the response, or alternatives which may be used to mitigate adverse effects.

5.4.5 Detailed Cost Analysis

A cost estimation will be completed for each of the remedial alternatives in which all capitol and operation and maintenance costs will be identified. In order to determine if the costs are eligible under Superfund, the activities will be divided into remedial action and post-closure costs. The remedial action costs, which are eligible for Superfund funding, will be the costs of the remedial actions directed at achieving cleanup goals. Any activity which occurs after completion of the remedial action are considered post-closure costs.

Capitol costs will consist of direct and indirect costs.

Direct capital costs may include:

- o Construction costs: Costs of materials, labor (including fringe benefits and worker's compensation), and equipment required to install a remedial action.

- o Equipment costs: Costs of remedial action and service equipment necessary to enact the remedy; these materials remain until the site remedy is complete.

- o Land and site-development costs: Expenses associated with purchase of land and development of existing property.

- o Buildings and service costs: Costs of process and nonprocess buildings, utility connections, purchased services, and disposal costs.

- o Relocation expenses: Costs of temporary or permanent accommodations for affected nearby residents. (Since cost estimates for relocations can be complicated, FEMA authorities and EPA Headquarters will be consulted in estimating these costs.)

- Disposal costs: Costs of transporting and disposing of waste materials, such as drums and contaminated soils.

Indirect capital costs may include:

- Engineering expenses: Costs of administration, design, construction supervision, drafting, and testing of remedial action alternatives.

- Legal fees and license or permit costs: Administrative and technical costs necessary to obtain licenses and permits for installation and operation.

- Startup and shakedown costs: Costs incurred during remedial action startup.

- Contingency allowances: Funds to cover costs resulting from unforeseen circumstances, such as adverse weather conditions, strikes, and inadequate site characterization.

Operation and maintenance costs are included in the detailed cost estimation. The following operation and maintenance costs will be considered:

- Operating labor costs: Wages, salaries, training, overhead, and fringe benefits associated with the labor needed for post-construction operations.

- Maintenance materials and labor costs: Costs for labor, parts, and other resources required for routine maintenance of facilities and equipment.

- Auxiliary materials and energy: Cost of items such as chemicals and electricity for treatment plant operations, water and sewer service, and fuel.

- Purchased services: Sampling costs, laboratory fees, and professional fees for which the need can be predicted.

- Administrative costs: Costs associated with administration of remedial action operation and maintenance not included under other categories.

- Insurance, taxes, and licensing costs: Costs of such items as liability and sudden accidental insurance; real estate taxes on purchased land or rights-of-way; licensing fees for certain technologies; and permit renewal and reporting costs.

- o Maintenance reserve and contingency funds: Annual payments into escrow funds to cover (1) costs of anticipated replacement or rebuilding of equipment and (2) any large unanticipated operation and maintenance costs.

- o Rehabilitation costs: To maintain equipment or structures that wear out over time.

- o Other costs: Items that do not fit any of the above categories.

Vendor estimates, cost estimates for similar projects, and standard costing guides will be used as sources of cost information.

A present worth analysis will be conducted following completion of the cost analysis for the individual remedial alternatives. To conduct the analysis a discount rate of 10 percent before taxes and after inflation will be assumed. The period of performance will not exceed 30 years.

Additionally, a sensitivity analysis will be completed for each remedial action alternative. The primary factor considered in the analysis will be effective life of remedial action, operation and maintenance costs, duration of cleanup, extent of cleanup, design parameters and discount rate.

A summary of alternative cost analysis composed of data developed in the cost estimation will be presented in tabular form. The three critical cost elements will be total capitol cost, present worth cost and cash flow over the life of the alternative.

5.5 TASK 5.0 - SUMMARIZE ALTERNATIVES

Once the detailed development of alternatives has been completed, a summary will be prepared to guide in the comparison of information and data collected. The summary will outline information in order that the relevant and applicable standard, health and environmental concerns, technological reliability, cost and other appropriate factors can be considered for each alternative. Primary consideration will be given to alternatives that attain or exceed applicable or relevant federal public health and environmental standards. Although it is anticipated that most remedial alternatives will attain or exceed relevant standards it is possible, in some circumstances that the remedial alternatives will not meet the standard. The specific circumstances are as follows:

1. The selected alternative is not the final remedy and will become part of a more comprehensive remedy;

2. All of the alternatives which meet applicable or relevant standards fall into one or more of the following categories:

   a. Fund balancing - for Fund financed actions only; exercise the fund balancing provisions of CERCLA section 104(c)(4);

   b. Technical impracticality - it is technically impractical from an engineering perspective to achieve the standard at the specific site in question;

   c. Unacceptable environmental impacts - all alternatives that attain or exceed standards would cause unacceptable damage to the environment; or,

3. Where the remedy is to be carried out pursuant to CERCLA section 106; the Hazardous Response Trust Fund is unavailable; there is a strong public interest in the expedited cleanup; and the litigation probably would not result in the desired remedy.

Relevant information on cost, health risks, and reliability will be presented for each remedial alternative, including the no-action alternative. It will be important to highlight the differences among the alternatives.

At minimum, the following information will be provided:

- o Present worth of total costs: The net present value of capital and operating and maintenance costs must be presented.

- o Health information: For the no action alternative, EPA prefers a quantitative statement including an estimated range of maximum individual risks. For source control options, a quantitative risk assessment is not required. For management of migration measures, a quantitative risk assessment, including an estimated range of maximum individual risks, is required.

- o Environmental effects: To simplify the evaluation, only the most important effects should be summarized. Reference can be made to supplemental information in a separate table, if necessary.

- o Technical aspects of the alternative: This information may strongly influence the selection of a remedial alternative, and it is important to describe carefully the technical advantages and disadvantages of alternatives. Such information generally is based on the professional opinion of engineers familiar with the site and with the technologies comprising the alternatives.

- Information on the extent to which alternatives meet the technical requirements and environmental standards of appropriate environmental regulations. This information will be arrayed so that differences between the alternatives, in terms of how they satisfy such standards, are readily apparent. The kinds of standards applicable at the site may include (1) RCRA design and operating standards, (2) drinking water standards, and (3) environmental discharge standards.

- Information on community effects. The types of information that will be provided include: (1) the extent to which implementing an alternative would disrupt the community (e.g., traffic, temporary health risks, and relocation) and (2) the likely public reaction.

- Information on remedies involving removal of materials for off-site disposal. This information will document compliance with EPA policy on selecting off-site EPA approved facilities for disposal of materials from CERCLA sites.

5.6 TASK 6.0 - FEASIBILITY STUDY REPORT

The FS Report will discuss and present the results of the Feasibility Study. A proposed Table of Contents is given below:

3.0 DETAILED SCREENING OF REMEDIAL ACTION TECHNOLOGIES

- 3.1 TECHNICAL
- 3.2 ENVIRONMENTAL/PUBLIC HEALTH
- 3.3 INSTITUTIONAL
- 3.4 OTHER SCREENING
- 3.5 COST
- 3.6 LIST OF REMEDIAL ACTION TECHNOLOGIES TO BE ASSEMBLED INTO REMEDIAL ACTION ALTERNATIVES

4.0 ASSEMBLAGE OF REMEDIAL ACTION TECHNOLOGIES INTO REMEDIAL ACTION ALTERNATIVES

- 4.1 ALTERNATIVE 1
- .
- .
- 4.x ALTERNATIVE X

5.0 DETAILED ANALYSIS OF REMEDIAL ACTION ALTERNATIVES

- 5.1 NON-COST ANALYSIS
  - 5.1.1 Technical Feasibility
  - 5.1.2 Environmental Evaluation
  - 5.1.3 Institutional Requirements
- 5.2 COST ANALYSIS

6.0 SUMMARY OF ALTERNATIVES

7.0 RECOMMENDED REMEDIAL ACTION

5.6.1 <u>Draft Feasibility Study Report</u>

A proposed outline of the draft report will be submitted to U.S. EPA prior to preparation to obtain concurrence with the report organization. The draft report presenting the results of evaluation conducted in tasks described in Sections 5.1 through 5.4 will be prepared. On the basis of the entire evaluation process, one technology or a combination of technologies will be recommended for consideration in the conceptional design. The draft report will be submitted to U.S. EPA and the appropriate State agency for review. Following receipt of review comments, the conceptual design task will be initiated and a revised draft feasibility study report incorporating the review comments, will be submitted to the U.S. EPA for use in the public hearing phase.

5.6.2 Public Hearing

A minimum four week comment period will be held on the draft Feasibility Study report. A public meeting will be held during this period to receive comments and questions on the recommended remedial technologies. A responsiveness summary will be prepared following this public comment period (REM II support for these activities is discussed in detail in Section 4.11).

5.6.3 Revised Report

A revised report will be prepared to include the technology evaluation process and conceptual design of the selected remedial action plan. Two copies (each) of the report will be submitted to the State and U.S. EPA for review. Agency comments will be incorporated into the document.

5.6.4 Final Feasibility Study

After the State and the U.S.EPA have reviewed the draft report and agency comments are incorporated into the document, final copies will be submitted.

5.7 TASK 7.0 - DECISION DOCUMENT PREPARATION ASSISTANCE

5.7.1 PRP Negotiation Briefing

Roy F. Weston, Inc. Will assist the U.S.EPA in all negotiations with potential responsible parties; that is, with the Skinner Landfill and its generators.

5.7.2 Decision Document Preparation Assistance

A draft of the record of decision will be prepared and submitted to the U.S.EPA. The U.S. EPA will assist in preparation and drafting of this document, based on the information obtained in previous tasks.

5.7.3 Summary of Remedial Technology Selection

After considering technical feasibility, public health, environmental impact, institutional involvement, and cost in detail, a remedial technology may be selected. All these factors will be considered in a final comparison of all technologies to justify their possible utilization.

5.8 TASK 8.0 - PRE-DESIGN REPORT

5.8.1 Process Development

Based on the results of the Feasibility Study, a pre-design report will be prepared for the selected technology. Initially, the hazardous waste management scheme will be better defined. During this initial process development phase, the individual processes that collectively formulate the total waste handling strategy will be selected. This will be based on the contaminants that must be managed, the degree of removal/destruction that must be achieved, and/or the containment/stabilization technology selected as a result of the Feasibility Study.

5.8.2 Conceptual Design

A conceptual design of the selected remedial technology will be prepared. The conceptual design package will be similar in content to a preliminary engineering design, in sufficient detail to allow development of final bid drawings and specifications.

The conceptual design will identify and cite reasons for the engineering criteria developed for each technology comprising the chosen technology. An implementation schedule for each component will be developed. This schedule will address phasing and segmenting. Budget cost estimates, minus 15 to plus 30 percent level of accuracy, will be developed.

The conceptual design package will include the following:

- Engineering design criteria and reasons for the selection of these criteria for each technology comprising the chosen technology.
- Conceptual plan view drawings and layouts for the overall site and facilities.
- Major equipment types with approximate capacities, sizes, and construction materials.
- Process flow sheets with mass balances.
- Operational description of process units or other facilities, including general piping and instrumentation layouts.
- Estimates of material or equipment quantities required.
- Revisions to the Community Relations Plan, as required, to reflect the conceptual design activities and potential impacts.

5.8.3 Preliminary Remediation Schedule

A preliminary remediation schedule will be prepared for final design, bidding, and implementation, including post-closure needs.

5.8.4 Preliminary Specifications Outline

An outline of major specification requirements and sections will be prepared. This will include a list of major equipment needs, as appropriate.

5.8.5 Conceptual Cost Estimate

An estimate of capital and operating costs will be prepared for the selected technology.

5.8.6 COE Coordination

COE will be preparing the detailed engineering design and associated plans and specification based on the Pre-Design Report. The contractor will coordinate with COE to ensure the final design reflects the waste management objectives of the conceptual design.

5.9 TASK 9.0 - WORK ASSIGNMENT COMPLETION REPORT

When remedial technologies have been evaluated in detail, a report will be issued. It will consist of a summary of research completed, the budget used, and the technical approaches considered. It will, in effect, summarize all that has been done and compare it to what was initially proposed.

5.10 TASK 10.0 - QUALITY ASSURANCE

Quality Assurance of the FS will be in accordance with the REM II Quality Assurance Project Plan and project specifications. Audits will be performed during the FS to ensure that quality assurance is being maintained.

5.11 TASK 11.0 - TECHNICAL AND FINANCIAL MANAGEMENT

Project Administration encompasses the following subtasks:

- Technical review and oversight
- Financial review and oversight
- Meetings
- Technical and financial reporting.

Technical review and oversight includes the technical direction and management provided by the Regional Managers and the Site Manager to the site team, from project initiation to completion on topics that are not task-specific.

Financial review and oversight includes the monitoring of budget status, and internal team rebudgeting, as necessary, depending on the level of effort provided by the project team. It also includes monitoring work efforts and forecasting of budget and manpower to schedule the personnel needed for the project.

5.11.1 Technical Reports

Reporting includes the efforts involved in preparing the required monthly technical and financial progress reports and computer input forms requested by U.S.EPA.

Two types of monthly progress reports are required. These are:

- Technical Progress Report
- Financial Management Report.

Technical Progress Reports will include the following:

- Site identification and activity
- Status of work tasks and progress to date with percent of completion defined
- Difficulties encountered or anticipated during the reporting period
- Actions being taken to resolve problem situations
- Key activities to be performed in the next month.
- Changes in personnel.

The monthly progress report will list target and actual completion dates for each activity, including project completion. The report will also include an explanation of any deviation from the milestones in the work plan schedule.

5.11.2 Financial Reports

Financial management reports will include the following:

- Actual costs for direct labor, expenses and subcontracts expended each month during the reporting period, including base fee.

SECTION 6

SCHEDULE

The estimated time for completion of this project is 18 months from the date that authorization is given to proceed has been recieved. This includes 10 months for remedial investigation and 9 months for the development of the feasibility study and the conceptual design. Figures 6-1 and 6-2 also identify and provide a schedule for the deliverables anticipated over the life of the project. These deliverables will be subject to internal (REM II Team) quality control and quality assurance procedures prior to submittal to U.S. EPA.

The schedule of activities are based on a two-week governmental review of documents submitted by the REM II team and a maximum two-week turn-around by the REM II Team for response to comments provided by U.S. EPA and Ohio EPA on draft material submitted.

F[illegible] 5-1

SKINNER LANDFILL REMED[illegible] INVESTIGATION SCHEDULE

Work Plan Section	Task	Subtask	Activity	Deliverable	Week (0 4 8 12 16 20 24 28 32 36 40 44)
			Final Work Plan to U.S. EPA	Work Plan	X
			U.S. EPA Approval		●●●●
			Subcontract Procurement		XXXXX
4.1	1	-	Site Mobilization		X
4.2-4.4	2-4	-	Site Investigations		XXXXXXXXXX XX
		-	Technical Memos		XXXX
		-	Approved CRL/CLP Data		●●●● ●●●●
4.5	5	-	Bench Scale Testing		XX
4.6	6	-	Data Validation	Report	X X
4.7	7	-	Contaminant Transport and Pathway Evaluation		X
4.8	8	-	Endangerment Assessment		XXX
4.9	9	-	RI Report (Draft)	Report Draft	XXXXXXXXXXXXX
			NEPD Review		OO
		2	U.S.EPA Review		●●
			Review Meeting		●

FIGU -1(continued)

SKINNER LANDFILL REMEDIAL INVESTIGATION SCHEDULE

Work Plan Section	Task	Subtask	Activity	Deliverable	Week												
					0	4	8	12	16	20	24	28	32	36	40	44	48
		3	RI Report (Final)	Final Report												XX	
4.11	11	-	Community Relations Support										AS APPROPRIATE				
4.12	12	-	Quality Assurance	QA Audit Memos					X	X				X			
4.13	13	-	Technical and Financial Management	Monthly Reports		X	X		X	X	X	X		X		X	X

X - Weston activity
O - REM II review
O - EPA Activity

FIGURE 6-2

SKINNER FEASIBILITY STUDY SCHEDULE

Work Plan Section	Task		Subtask	Activity	Deliverable	Week (0 4 8 12 16 20 24 28 32 36 40 44 48 52 56 60 64 68 72)
5.1	1	-	Preliminary Remedial Alternative Development	Remedial Alternatives/ Technology Memorandum		XXXO
5.2	2	-	Remedial Alternative Screening	Alternative Screening Memorandum		XXXXO
5.3	3	-	Remedial Alternative Analysis	Alternative Analysis Memorandum		XXXXO
5.4	4	-	Comparative Evaluation of Acceptable Alternatives	Cost Effectiveness Analysis Memorandum		XXXXXO
5.5	5	-	Feasibility Study Report			
		1	Draft FS Report	Draft FS Report		XXXXXO
		2	Revised Draft FS Report	Revised Draft FS Report		XXXO
		3	Public Hearing			O
		4	Final FS Report	Final FS Report		XXXXXO
5.6	6	-	EPA Decision Document Preparation Assistance			
		1	PRP Negotiation Briefing	Negotiation Memo		XXXO
		2	EPA Decision Document	ROD		XXXXXXXX
		3	Summary of Alternatives	Summary of Remedial Alternatives		XXXO
5.7	7	-	Pre-Design Report	Pre-Design Report		XXXXXO

FIGURE (continued)

SKINNER FEASIBILITY STUDY SCHEDULE

Work Plan Section	Task	Subtask	Activity	Deliverable	Week 0 4 8 12 16 20 24 28 32 36 40 44 48 52 56 60 64 68 72
		1	Process Development		
		2	Conceptual Design	Conceptual Design	XXXXXXXXOOOOO
		3	Preliminary Remediation Schedule	Schedule	XXOO
		4	Preliminary Specification Outline	Specification Outline	XXOO
		5	Conceptual Cost Estimate	Cost Estimate	XXOO
		6	COE Coordination		
5.8	8	-	Work Assignment Completion Report	Draft WACR	XXOO
5.9	9	-	Community Relations Support		
5.10	10	-	Quality Assurance		
5.11	11	-	Technical and Financial Management	Monthly Reports	X X X X X X X X X X X X X X X X X X X

X - Weston activity
O - REM II review
O - EPA review

SECTION 7

STAFFING PLAN

A project team has been assembled to meet the needs of the RI/FS at the Skinner Landfill site. Figure 7-1 shows the organization chart for the completion of this project. Resumes of the key personnel for this project are included as Appendix E.

The REM II Team Region V Manager is Mr. John Hawthorne, P.E. Mr. Hawthorne has the overall responsibility for completing the project to satisfaction of the U.S. EPA and the OEPA. Mr. Hawthorne provides upper level management contact between the REM II Team, the REM National Program Management Office and EPA Region V management personnel. He will resolve any conflicts that arise and has ultimate responsibility for the successful completion of this project.

Mr. R. Michael Bort, P.E., has been selected as the Site Manager. Mr. Bort has more than eight years of experience in hazardous waste management and wastewater treatment and has managed several projects similar in scope and budget to the Skinner Landfill.

Mr. Bort will be supported by a project team of personnel from Roy. F. Weston, Inc., and Clement Associates. Weston will be responsible for conducting the bulk of the technical and management work activities under this project while ICF and Clement will provide specialized services in the area of risk assessment, respectively. Mr. Edward Need, P.G., will serve as lead project geologist and will be the principal investigator for the remedial investigation. Mr. Michael Loch, Project Engineer with Weston, will serve as Site Team Leader. Dr. P. Krishnan, P.E., will serve as lead project engineer and will be the principal investigator for the feasibility study portion of the project. Dr. Earl Hansen and Ms. Diane Therry will provide data validation services.

Dr. Ian T. Nesbit, Ph.D., will act as Lead Investigator for the Endangerment Assessment and Risk Assessment tasks for this project. Ms. Carol Andress will serve as principle support staff in the community relations area. Other personnel will support these individuals on an as-needed basis during the various phases of the project, with the largest need for support being during the field investigation and for technical consultation and QA/QC review of prepared documents (memoranda and reports).

Additional subcontractors (refer to Section 8.0 Subcontracting Plan) will be required for the site investigation work. Subcontractors will provide the required equipment and their efforts will be directed toward accomplishing the following tasks:

- o Well drilling
- o Backhoe operator

SECTION 8

SUBCONTRACTING PLAN

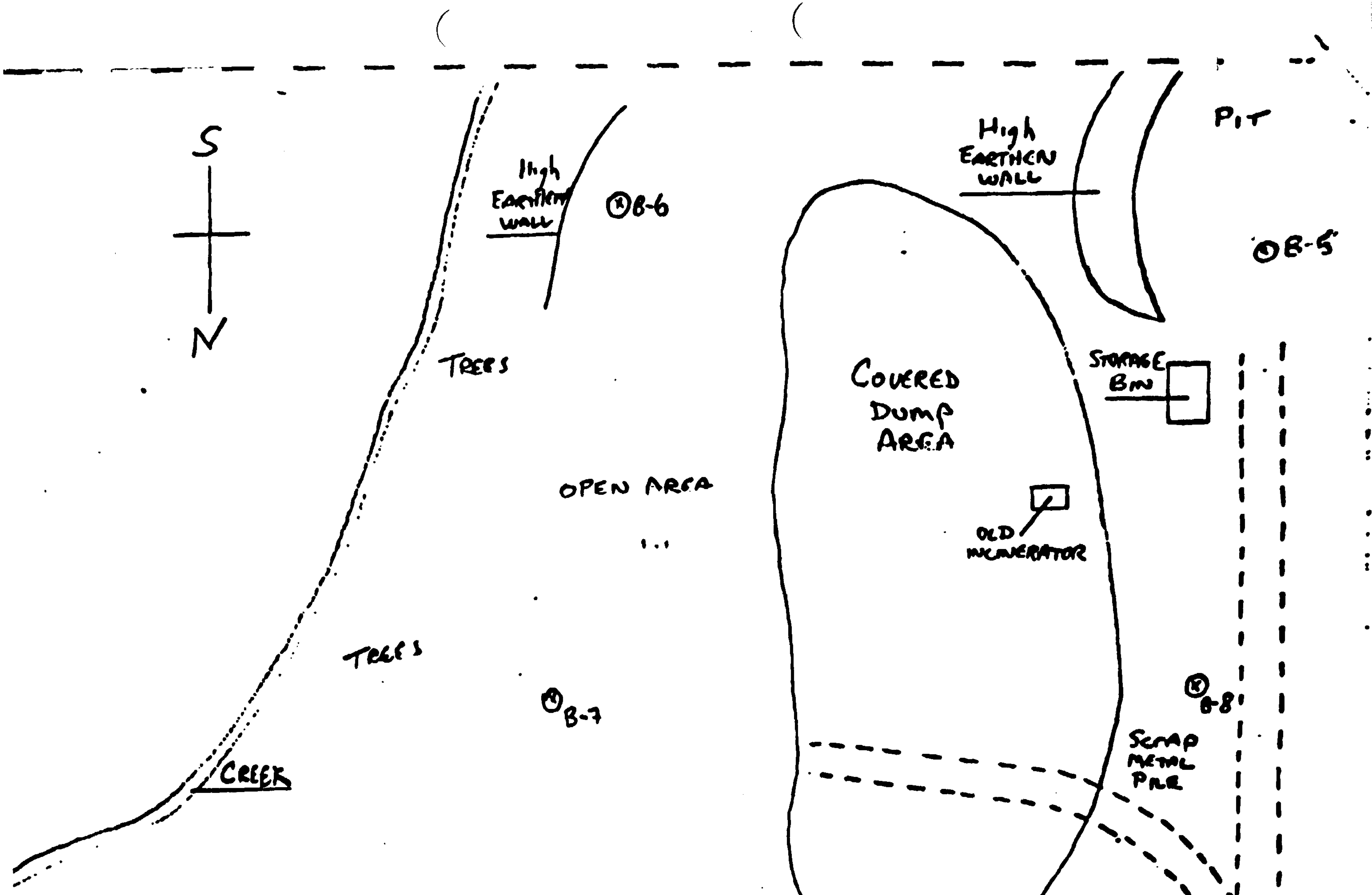
Names of the individual subcontractors that will actually be used and their respective estimated costs are not currently available. Bids will be solicited from firms pre-qualified on the REM II Basic Ordering Agreement (BOA) list. When possible, MBE and WBE firms will be utilized as project subcontractors.

The site manager will be responsible for coordinating the scheduling and on-site efforts of all subcontractors. The field investigation coordinator will be responsible for coordinating and monitoring daily remedial investigation activities at the site. This responsibility will include supervising the efforts of all subcontractors to ensure project schedules are adherred to. The field investigation coordinator will maintain open lines of communication between the subcontractors, their on-site representatives and the site manager as required to assure the on-site remedial investigation is a coordinated effort by all parties involved and the RI field objectives are accomplished.

APPENDIX A

FIT Monitoring Wells

7-27-82



SKINNER LANDFILL
F5-8203-06-24
150 Cincinnati-Dayton Rd
West Chester, Ohio
7-20-82
Sketch not to scale

01.5V73.01015 ~~H Kaufman~~ DJB

7-20-82

Skinner Landfill FS-8203-06-24

Case 1195

OTR	ITR	LOCATION		
E1404	ME8754	Well 5	7-27-82	9:30am
E1405	ME 9067	Well 6	7-27-82	9:30am
E1408	ME 9070	BLANK	7-27-82	

WELLS B-7 and B-8 WERE DRY

ORGANICS SHIPPED TO Mead CompuChem

INORGANICS SHIPPED TO Rocky Mountain Analytical

U. S. ENVIRONMENTAL PROTECTION AGENCY - HWI Sample Management Office

114 North Columbus Street - Alexandria, Virginia 22314

Laboratory Name ROCKY MOUNTAIN ANALYTICAL Case No. SAS 223I QC Report No. 137

Units mg/l or mg/kg (circle one) Skinner L. J. 1195 FS-8203-6 #24 Low Water

RMA Sample No.	Ag	Al	B	Ba	Be	Cr	Co	Cu	Fe	Mn	Ni	V	Zn	Zn		
5055-01	0.030	0.53	N	0.35	ND	.055	0.31	ND	8.7	18	0.41	ND	~~0.058~~	0.41	82MG11S6[illegible]	
02	0.012	16		0.48	↓	.045	0.19	0.065	55	26	0.30	↓	~~0.052~~	0.39	82MG11S6[illegible]	
03	ND	ND	A	ND	↓	ND	ND	ND	0.22	0.085	ND	↓	~~ND~~	0.010	82MG11R1[illegible]	

Units mg/l or mg/kg (circle one)

RMA Sample No.	As	Cd	Hg	Pb	Sb	Se	Sn	Tl
5055-01	ND	0.064	ND	0.54	ND	0.011	ND	ND
02	0.018	0.032	0.0003	0.023	↓	ND	↓	↓
03	ND	0.001	ND	ND	↓	ND	↓	↓

TASK 3. Units mg/l or mg/kg (circle one)

CN	NH_3	S	
ND	N		82MG11S67
↓			82MG11S68
↓		A	82MG11R12

U.S. ENVIRONMENTAL PROTECTION AGENCY-HWI Sample Management Office
P.O. Box 818, Alexandria, VA 22313 - 703/683-0885

82MG11S67
Sample Number

ORGANICS ANALYSIS DATA SHEET

CH 1195-E1404

Skinner L. J.
F5-8203-6 #24
Low Water

Laboratory Name Mead CompuChem
Lab Sample ID No. 18099
QC Report No. 17-102, 13-74, 27-103

	ACID COMPOUNDS	ug/l
21A	2,4,6-trichlorophenol	ND
22A	p-chloro-m-cresol	ND
24A	2-chlorophenol	ND
31A	2,4-dichlorophenol	ND
34A	2,4-dimethylphenol	ND
57A	2-nitrophenol	ND
58A	4-nitrophenol	ND
59A	2,4-dinitrophenol	ND
60A	4,6-dinitro-o-cresol	ND
64A	pentachlorophenol	ND
65A	phenol	ND

	BASE/NEUTRAL COMPOUNDS	ug/l
1B	acenaphthene	ND
5B	benzidine	ND
8B	1,2,4-trichlorobenzene	ND
9B	hexachlorobenzene	ND
12B	hexachloroethane	ND
18B	bis(2-chloroethyl)ether	NA
20B	2-chloronaphthalene	ND
25B	1,2-dichlorobenzene	ND
26B	1,3-dichlorobenzene	ND
27B	1,4-dichlorobenzene	ND
28B	3,3'-dichlorobenzidine	ND
35B	2,4-dinitrotoluene	ND
36B	2,6-dinitrotoluene	ND
37B	1,2-diphenylhydrazine (as azobenzene)	ND
39B	fluoranthene	ND
40B	4-chlorophenyl phenyl ether	ND

	BASE/NEUTRAL COMPOUNDS	ug/l
41B	4-bromophenyl phenyl ether	ND
42B	bis-(2-chloroisopropyl)ether	ND
43B	bis(2-chloroethoxy)methane	ND
52B	hexachlorobutadiene	ND
53B	hexachlorocyclopentadiene	ND
54B	isophorone	ND
55B	naphthalene	ND
56B	nitrobenzene	ND
61B	N-nitrosodimethylamine	NA
62B	N-nitrosodiphenylamine	ND
63B	N-nitrosodi-n-propylamine	ND
66B	bis(2-ethylhexyl)phthalate	ND
67B	butyl benzyl phthalate	ND
68B	di-n-butyl phthalate	ND
69B	di-n-octyl phthalate	ND
70B	diethyl phthalate	ND
71B	dimethyl phthalate	ND
72B	benzo(a)anthracene	ND
73B	benzo(a)pyrene	ND
74B	3,4-benzofluoranthene	ND
75B	benzo(k)fluoranthene	ND
76B	chrysene	ND
77B	acenaphthylene	ND
78B	anthracene	ND
79B	benzo(ghi)perylene	ND
80B	fluorene	ND
81B	phenanthrene	ND
82B	dibenzo(a,h)anthracene	ND
83B	indeno(1,2,3-cd)pyrene	ND
84B	pyrene	ND

Laboratory Name , Wood CompuChem

Lab Sample ID NO. 18D99

QC Report NO. 17-102, 17-74, 97-103

2.0

VOLATILES	ug/l
2V acrolein	ND
3V acrylonitrile	ND
4V benzene	ND
6V carbon tetrachloride	ND
7V chlorobenzene	ND
10V 1,2-dichloroethane	ND
11V 1,1,1-trichloroethane	ND
13V 1,1-dichloroethane	ND
14V 1,1,2-trichloroethane	ND
15V 1,1,2,2-tetrachloroethane	ND
16V chloroethane	ND
19V 2-chloroethylvinyl ether	ND
23V chloroform	ND
29V 1,1-dichloroethylene	ND
30V 1,2-trans-dichloroethylene	ND
32V 1,2-dichloropropane	*
33V 1,3-dichloropropylene	ND
38V ethylbenzene	ND
44V methylene chloride	ND
45V methyl chloride	ND
46V methyl bromide	ND
47V bromoform	ND
48V dichlorobromomethane	ND
49V trichlorofluoromethane	ND
50V dichlorodifluoromethane	NA
51V chlorodibromomethane	ND
85V tetrachloroethylene	ND
86V toluene	ND
87V trichloroethylene	ND
88V vinyl chloride	ND

ND = NOT DETECTED

2.2

PESTICIDES	ug/l
89P aldrin	ND
90P dieldrin	ND
91P chlordane	ND
92P 4,4'-DDT	ND
93P 4,4'-DDE	ND
94P 4,4'-DDD	ND
95P alpha-endosulfan	ND
96P beta-endosulfan	ND
97P endosulfan sulfate	ND
98P endrin	ND
99P endrin aldehyde	ND
100P heptachlor	ND
101P heptachlor epoxide	ND
102P alpha-BHC	ND
103P beta-BHC	ND
104P delta-BHC	ND
105P gamma-BHC	ND
106P PCB-1242	ND
107P PCB-1254	ND
108P PCB-1221	ND
109P PCB-1232	ND
110P PCB-1248	ND
111P PCB-1260	ND
112P PCB-1016	ND
113P toxaphene	ND

DIOXINS

129B 2,3,7,8-tetrachlorodibenzo-p-dioxin	ND

*Less than 10 ug/l

(pesticides less than, 1ug/l)

CASE NO: HEAD COMPUCHEM

REPORT NO: 17-43, 17-34, 27-63.

15079

SAMPLE NUMBER C#195-E1404

B. TENTATIVELY IDENTIFIED COMPOUNDS

	CAS #	COMPOUND NAME	FRACTION	$ MAXIMUM SCORE ATTAINED MASS MATCHING ROUTINES ______ (SPECIFY)
1		NONE FOUND		
2				
3				
4				
5				
6				
7				
8				
9				
1[illegible]				
11				
1[illegible]				
1[illegible]				
1[illegible]				
1[illegible]				
1[illegible]				
1				
20				
2				
22				
2				
24				
2				
26				
2				
28				

U.S. ENVIRONMENTAL PROTECTION AGENCY-HWI Sample Management Office
P.O. Box 818, Alexandria, VA 22313 - 703/683-0885

82M611568
Sample Number

ORGANICS ANALYSIS DATA SHEET

CH1195-E1405

Laboratory Name Mead CompuChem
Lab Sample ID NO. 18097
QC Report NO. 17-62, 19-74, 27-63

Skinner L.J.
F5-8203-6 #24
Low Water

ACID COMPOUNDS		ug/l
21A	2,4,6-trichlorophenol	ND
22A	p-chloro-m-cresol	ND
24A	2-chlorophenol	ND
31A	2,4-dichlorophenol	ND
34A	2,4-dimethylphenol	ND
57A	2-nitrophenol	ND
58A	4-nitrophenol	ND
59A	2,4-dinitrophenol	ND
60A	4,6-dinitro-o-cresol	ND
64A	pentachlorophenol	ND
65A	phenol	ND

BASE/NEUTRAL COMPOUNDS		ug/l
1B	acenaphthene	ND
5B	benzidine	ND
8B	1,2,4-trichlorobenzene	ND
9B	hexachlorobenzene	ND
12B	hexachloroethane	ND
18B	bis(2-chloroethyl)ether	NA
20B	2-chloronaphthalene	ND
25B	1,2-dichlorobenzene	ND
26B	1,3-dichlorobenzene	ND
27B	1,4-dichlorobenzene	ND
28B	3,3'-dichlorobenzidine	ND
35B	2,4-dinitrotoluene	ND
36B	2,6-dinitrotoluene	ND
37B	1,2-diphenylhydrazine (as azobenzene)	ND
39B	fluoranthene	ND
40B	4-chlorophenyl phenyl ether	ND
41B	4-bromophenyl phenyl ether	ND
42B	bis-(2-chloroisopropyl)ether	350
43B	bis(2-chloroethoxy)methane	ND
52B	hexachlorobutadiene	ND
53B	hexachlorocyclopentadiene	ND
54B	isophorone	ND
55B	naphthalene	*
56B	nitrobenzene	ND
61B	N-nitrosodimethylamine	NA
62B	N-nitrosodiphenylamine	ND
63B	N-nitrosodi-n-propylamine	ND
66B	bis(2-ethylhexyl)phthalate	ND
67B	butyl benzyl phthalate	ND
68B	di-n-butyl phthalate	ND
69B	di-n-octyl phthalate	ND
70B	diethyl phthalate	*
71B	dimethyl phthalate	ND
72B	benzo(a)anthracene	ND
73B	benzo(a)pyrene	ND
74B	3,4-benzofluoranthene	ND
75B	benzo(k)fluoranthene	ND
76B	chrysene	ND
77B	acenaphthylene	ND
78B	anthracene	ND
79B	benzo(ghi)perylene	ND
80B	fluorene	ND
81B	phenanthrene	ND
82B	dibenzo(a,h)anthracene	ND
83B	indeno(1,2,3-cd)pyrene	ND
84B	pyrene	ND

ORGANICS ANALYSIS DATA SHEET—Page 2

Sample Number
CH 1195-E1405

Laboratory Name: Wood CompuChem

Lab Sample ID No. 18077

QC Report No. 17-62,18-74,27-63

** VOLATILES		ug/l
2V	acrolein	ND
3V	acrylonitrile	ND
4V	benzene	79
6V	carbon tetrachloride	ND
7V	chlorobenzene	ND
10V	1,2-dichloroethane	163
11V	1,1,1-trichloroethane	13
13V	1,1-dichloroethane	131
14V	1,1,2-trichloroethane	*
15V	1,1,2,2-tetrachloroethane	ND
16V	chloroethane	35
19V	2-chloroethylvinyl ether	ND
23V	chloroform	17
29V	1,1-dichloroethylene	ND
30V	1,2-trans-dichloroethylene	60
32V	1,2-dichloropropane	283
33V	1,3-dichloropropylene	ND
38V	ethylbenzene	*
44V	methylene chloride	17
45V	methyl chloride	ND
46V	methyl bromide	ND
47V	bromoform	ND
48V	dichlorobromomethane	ND
49V	trichlorofluoromethane	ND
50V	dichlorodifluoromethane	NA
51V	chlorodibromomethane	ND
85V	tetrachloroethylene	ND
86V	toluene	450
87V	trichloroethylene	*
88V	vinyl chloride	24

PESTICIDES		ug/l
89P	aldrin	ND
90P	dieldrin	ND
91P	chlordane	ND
92P	4,4'-DDT	ND
93P	4,4'-DDE	ND
94P	4,4'-DDD	ND
95P	alpha-endosulfan	ND
96P	beta-endosulfan	ND
97P	endosulfan sulfate	ND
98P	endrin	ND
99P	endrin aldehyde	ND
100P	heptachlor	ND
101P	heptachlor epoxide	ND
102P	alpha-BHC	ND
103P	beta-BHC	ND
104P	delta-BHC	ND
105P	gamma-BHC	ND
106P	PCB-1242	ND
107P	PCB-1254	ND
108P	PCB-1221	ND
109P	PCB-1232	ND
110P	PCB-1248	ND
111P	PCB-1260	ND
112P	PCB-1016	ND
113P	toxaphene	ND

DIOXINS		
129B	2,3,7,8-tetrachlorodibenzo-p-dioxin	ND

*Less than 10 ug/l

LOT NO: 17-12, 15-74, 27-83

SAMPLE NUMBER
C4119S-E405

B. TENTATIVELY IDENTIFIED COMPOUNDS.

CAS #	COMPOUND NAME	FRACTION	% MAXIMUM SCORE ATTAINED MASS MATCHING ROUTINES Purity (SPECIFY)
1	Benzoic acid, 4-Chloro-	Acid	87%
2	1-Propanol, 2,3-Dichloro	B/N	58%
3	Benzenemethanol, Alpha, Alpha-Dimethyl	B/N	82%
4	Benzene 1,4, Dimethyl	B/N	49%
5	Furan, 2-Butyl Tetrahydro	B/N	51%
6	Ethane 1,2-Bis(2-chloroethoxy)	B/N	50%
7	1(3-H) Isobenzofuranone 5-Meth	B/N	52%
8	Ethane 1,1-Oxybis 2-Ethoxy	B/N	50%
9	1-Propene	VOA	92%
10	2-Propanone	VOA	92%
11	Propane, 2-Chloro	VOA	84%
12	Propane, 1-Chloro	VOA	92%
13	1-Propene, 3-Chloro-2-Methyl-	VOA	73%
14	Butanamide	VOA	18%
15	2-Pentanone, 4-Methyl	VOA	72%
16	2-Pentanone, 4-Methyl	VOA	33%
17	Cyclotrisiloxane, Hexamethyl	VOA	76%
18	Benzene, 1,2-Dimethyl	VOA	52%
19	Benzene, Ethyl	VOA	61%
20	Ethanol, 2-(2-Chloroethoxy)	VOA	45%

** Poor Spectral match (major peaks are missing)

YF, CRC
8/23/85

U.S. ENVIRONMENTAL PROTECTION AGENCY-HWI Sample Management Office
P.O. Box 818, Alexandria, VA 22313 - 703/683-0885

82M6/11R12
Sample Number

ORGANICS ANALYSIS DATA SHEET

CH1195-E1408

Laboratory Name Mead CompuChem
Lab Sample ID No. 18098
QC Report No. 17-65, 17-74, 27-63

Skinner L. F.
F5-8203-6 #24
Low Water

ACID COMPOUNDS	ug/l
21A 2,4,6-trichlorophenol	ND
22A p-chloro-m-cresol	ND
24A 2-chlorophenol	ND
31A 2,4-dichlorophenol	ND
34A 2,4-dimethylphenol	ND
57A 2-nitrophenol	ND
58A 4-nitrophenol	ND
59A 2,4-dinitrophenol	ND
60A 4,6-dinitro-o-cresol	ND
64A pentachlorophenol	ND
65A phenol	ND

BASE/NEUTRAL COMPOUNDS	ug/l
1B acenaphthene	ND
5B benzidine	ND
8B 1,2,4-trichlorobenzene	ND
9B hexachlorobenzene	ND
12B hexachloroethane	ND
18B bis(2-chloroethyl)ether	NA
20B 2-chloronaphthalene	ND
25B 1,2-dichlorobenzene	ND
26B 1,3-dichlorobenzene	ND
27B 1,4-dichlorobenzene	ND
28B 3,3'-dichlorobenzidine	ND
35B 2,4-dinitrotoluene	ND
36B 2,6-dinitrotoluene	ND
37B 1,2-diphenylhydrazine (as azobenzene)	ND
39B fluoranthene	ND
40B 4-chlorophenyl phenyl ether	ND

BASE/NEUTRAL COMPOUNDS	ug/l
41B 4-bromophenyl phenyl ether	ND
42B bis-(2-chloroisopropyl)ether	ND
43B bis(2-chloroethoxy)methane	ND
52B hexachlorobutadiene	ND
53B hexachlorocyclopentadiene	ND
54B isophorone	ND
55B naphthalene	ND
56B nitrobenzene	ND
61B N-nitrosodimethylamine	NA
62B N-nitrosodiphenylamine	ND
63B N-nitrosodi-n-propylamine	ND
66B bis(2-ethylhexyl)phthalate	ND
67B butyl benzyl phthalate	ND
68B di-n-butyl phthalate	ND
69B di-n-octyl phthalate	ND
70B diethyl phthalate	ND
71B dimethyl phthalate	ND
72B benzo(a)anthracene	ND
73B benzo(a)pyrene	ND
74B 3,4-benzofluoranthene	ND
75B benzo(k)fluoranthene	ND
76B chrysene	ND
77B acenaphthylene	ND
78B anthracene	ND
79B benzo(ghi)perylene	ND
80B fluorene	ND
81B phenanthrene	ND
82B dibenzo(a,h)anthracene	ND
83B indeno(1,2,3-cd)pyrene	ND
84B pyrene	ND

ORGANICS ANALYSIS DATA SHEET—Page 2

Sample Number CH1195-E1408

Laboratory Name: Nead CompuChem

Lab Sample ID NO. 18098

QC Report NO. 17-62,119-74,27-63

VOLATILES		ug/l
2V**	acrolein	ND
3V	acrylonitrile	ND
4V	benzene	ND
6V	carbon tetrachloride	ND
7V	chlorobenzene	ND
10V	1,2-dichloroethane	ND
11V	1,1,1-trichloroethane	ND
13V	1,1-dichloroethane	ND
14V	1,1,2-trichloroethane	ND
15V	1,1,2,2-tetrachloroethane	ND
16V	chloroethane	ND
19V	2-chloroethylvinyl ether	ND
23V	chloroform	ND
29V	1,1-dichloroethylene	ND
30V	1,2-trans-dichloroethylene	ND
32V	1,2-dichloropropane	ND
33V	1,3-dichloropropylene	ND
38V	ethylbenzene	ND
44V	methylene chloride	ND
45V	methyl chloride	ND
46V	methyl bromide	ND
47V	bromoform	ND
48V	dichlorobromomethane	ND
49V	trichlorofluoromethane	ND
50V	dichlorodifluoromethane	NA
51V	chlorodibromomethane	ND
85V	tetrachloroethylene	ND
86V	toluene	ND
87V	trichloroethylene	ND
88V	vinyl chloride	ND

ND = NOT DETECTED

PESTICIDES		ug/l
89P	aldrin	ND
90P	dieldrin	ND
91P	chlordane	ND
92P	4,4'-DDT	ND
93P	4,4'-DDE	ND
94P	4,4'-DDD	ND
95P	alpha-endosulfan	ND
96P	beta-endosulfan	ND
97P	endosulfan sulfate	ND
98P	endrin	ND
99P	endrin aldehyde	ND
100P	heptachlor	ND
101P	heptachlor epoxide	ND
102P	alpha-BHC	ND
103P	beta-BHC	ND
104P	delta-BHC	ND
105P	gamma-BHC	ND
106P	PCB-1242	ND
107P	PCB-1254	ND
108P	PCB-1221	ND
109P	PCB-1232	ND
110P	PCB-1248	ND
111P	PCB-1260	ND
112P	PCB-1016	ND
113P	toxaphene	ND

DIOXINS		
129B	2,3,7,8-tetrachlorodibenzo-p-dioxin	ND

*Less than 10 ug/l

(pesticides less than, 1ug/l)

ID: 1962,19-78,27-63

SAMPLE NUMBER
CH1195-E140

B. TENTATIVELY IDENTIFIED COMPOUNDS

CAS #	COMPOUND NAME	FRACTION	% MAXIMUM SCORE ATTAINED MASS MATCHING ROUTINES ______ (SPECIFY)
	None found		

APPENDIX B

Waste In Lagoon

5-11-76

Table 2-2
QUANTITATIVE RESULTS OF LABORATORY ANALYSIS
PIT OOZE AND BARREL LIQUID
SKINNER LANDFILL

Collection Date: May 11, 1976

Constitutent (All results in mg/l)	SAMPLE NUMBER #13750	#13751	#13752	#13753	#13754
Cyanide	6.76	7.5	0.36	5.4	761
Cadmium	755	180	2.0	5.6	50
Chromium (total)	160	65	4.0	350	126
Lead (total)	1,050	285	--	1,370	554
Mercury (total)	0.047	0.0135	0.006	0.01	0.075
Zinc	480	165	20.0	420	325
Copper	185	129	2.1	269	1,840
Phenol	27.3	24	12.8	8.8	11.2

The above samples were tested at the U.S. EPA Cincinnati Lab.

	#13750	#13751
Cyanide	9.1	7.7

The sample above was tested at the ODH Lab.

Identification of samples

- #13750 - Liquid in pit (black color)
- #13751 - Liquid in pit (orange color)
- #13752 - Barrel recovered from pit
- #13753 - Barrel recovered from pit
- #13754 - Barrel recovered from pit

GLT420/7

Source: Skinner Landfill Site - Remedial Action Master Plan

Results on Laboratory Analysis of Samples Collected

@Skinner Landfill, Union Twp., Butler County

Date of Collection: May 11, 1976

Identification of samples (ODH lab number)

#13750-Liquid in pit (black color)
#13751-Liquid in pit (orange color)
#13752-Barrel recovered from pit
#13753-Barrel recovered from pit
#13754-Barrel recovered from pit

Constituent (All results in mg/l(ppm))	#13750	#13751	#13752	#13753	#13754
Cyanide	6.76	7.5	0.36	5.4	761
Cadmium	755	180	2.0	5.6	50
Chromium(total)	160	65	4.0	350	126
Lead(total)	1050	285	——	1370	554
Mercury(total)	0.047	0.0135	0.006	0.01	0.075
Zinc	480	165	20.0	420	325
Copper	185	129	2.1	269	1840
Phenol	27.3	24	12.8	8.8	11.2

U.S.EPA (Cincinnati lab)

	#13750	#13751
Cyanide	9.1 mg/l	7.7 mg/l

Qualitative determination by gas chromotography-Mass Spectrophotometry process of the constituents in the liquid from Skinner landfill (U.S.EPA Lab-Cincinnati)
Comment: major portion of "ooze" is composed of pesticide intermediat Compounds: compounds from which pesticides are formulated, and are in their own right toxic.

Trichloropropane
Dichlorobenzene
1, 3 Hexachlorobutadiene (Aldrin Component)
Naphthalene (A major Component)
Hexachlorocyclopentadiene
Methyl Napthalene (Two Isomers)
Iso-Butyl Benzolate
HexachloroNor-Bornadine (Endrin Intermediate)
Octachloro-cyclo-pentene (The major component, chlordane intermediate)
Heptachlor-nor-borene (Major component-possibly heptachlor intermediate)
Hexachlorbenzene (Major Component)
Chlordene (Chlordane Derivative?)
Methyl Benzyl Phenone
Octachlor penta fulvalene

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
CINCINNATI, OHIO 45268

ENVIRONMENTAL MONITORING AND
SUPPORT LABORATORY - CINCINNATI

June 4, 1976

Mr. John E. Richards
Ohio Environmental Protection Agency
Post Office Box 1049
Columbus, Ohio 43216

Dear Mr. Richards:

As requested by telephone on May 19, 1976, we have analyzed the samples delivered to us by Mr. Ken Harsh on May 20. The results of our examinations to this date are:

Sample Identification	Analytical Result
#76-18-#1 Pit Trench	Total cyanide - 9.1 mg/kg (wet weight) Organic compounds found and identified: trichloropropane dichlorobenzene 1,3-hexachlorobutadiene naphthalene - a major component hexachlorocyclopentadiene methyl naphthalene (2 isomers) isobutyl benzoate hexachloronorbornadiene octachlorocyclopentene - the major component heptachloronorbornene - a major component hexachlorobenzene - a major component chlordene - a major component methyl benzophenone octachloropentafulvalene
#76-19-#2 Pit Trench	Total cyanide = 7.7 mg/kg Organic compounds found and identified: trichloropropane dichlorobenzene 1,3-hexachlorobutadiene

naphthalene - a major component
hexachlorocyclopentadiene
methyl naphthalene (2 isomers)
isobutyl benzoate
hexachloronorbornadiene
octachlorocyclopentene - the major component
heptachloronorbornene - a major component
hexachlorobenzene - a major component
chlordene - a major component
methyl benzophenone
octachloropentafulvalene
benzoic acid

The samples are being held under Chain of Custody procedures for further analyses and submission as evidence if required.

Sincerely yours,

Dwight G. Ballinger

Dwight G. Ballinger
Director
Environmentl Monitoring and Support Laboratory - Cincinnati

cc: Dr. Edward Glod, Ohio EPA

APPPENDIX C

Private Wells

5-3-76

Table 2-5
GROUNDWATER ANALYSES (mg/l)
SKINNER LANDFILL

LOCATION:	Well B-5	Well B-6	Blank	Douglas Residence	Hancock Residence	EPA Water Quality Criteria
DATE:	07/27/82	07/27/82	07/27/82	05/03/76	05/03/76	
Silver (Ag)	0.030	0.012	ND			0.05
Aluminum (Al)	0.53	16	ND			—
Barium (Ba)	0.35	0.48	ND	< 0.20	.020	1
Beryllium (Be)	ND	ND	ND			—
*Chromium (Cr)	0.055	0.045	ND	< 0.03	< 0.03	0.50
Cobalt (Co)	0.31	0.19	ND			—
*Copper (Cu)	ND	0.065	ND	< 0.03	< 0.03	—
Iron (Fe)	8.7	55	0.22	< 0.03	0.14	—
Manganese (Mn)	18	7.6	0.035			—
*Nickel (Ni)	0.41	0.30	ND	< 0.1	< 0.1	13.4
Vanadium (V)	ND	ND	ND			—
*Zinc (Zn)	0.41	0.39	0.040	0.27	0.70	—
*Arsenic (As)	ND	0.018	ND	< 0.01	< 0.01	0.05
*Cadmium (Cd)	0.064	0.032	0.001	< 0.01	< 0.01	0.010
*Mercury (Hg)	ND	0.00033	ND	< 0.005	< 0.005	0.002
*Lead (Pb)	0.54)	0.023	ND	< 0.01	< 0.01	0.050
Selenium (Se)	0.011	ND	ND			0.01
Antimony (Sb)	ND	ND	ND			—
Tin (Sn)	ND	ND	ND			—
Thallium (Te)	ND	ND	ND			—
Cyanide	ND	ND	ND	< .01	< .01	—
Calcium Carbonate				374	306	—
Sulfate				81	52	—
Chloride				42	10	—
Phenols				< 2	< 2	—

ND = Not detected.
* = Priority pollutant.
— = No criteria set.

GLT420/10

Source: Skinner Landfill Site – Remedial Action Master Plan

APPENDIX D

Surface Water Downstream

5-25-76
7-27-77

WATER QUALITY DATA

Laboratory Number: 2911

Date Received: 5-25-76

Date Reported: ~~Feb~~ 6-7-76

Laboratory: INDUSTRIAL

Analyst: Vanie / McKund

Station: West Chester, Ohio

County: Butler

Collected by: J.L. Hosler

Phone: 461-

Location of Sample: Stream Below Skinner Prop.

Date of grab sample (or last date of composite sample):

Year		Month		Day		Hour		Minute	
7	6	0	5	2	5	1	C	0	0

Sample Types: ☐ Ground Water ☐ Industrial ☐ Sewage ☐ Comp Mon ☐ Water Supply ☒ Stream

Beginning Date of Composite Sample: Year Month Day Hour Minute

Analysis to be Reported to: ☐ CO ☐ CDO ☐ SE ☐ NE ☒ SW ☐ NW

REASON FOR TAKING SAMPLE — ADDITIONAL INFORMATION — REMARKS BY ANALYST:

PRESERVATIVE:
☐ NaOH
☐ $CuSO_4$
☐ H_2SO_4
☐ HNO_3
☐ OTHER

run ~~organic~~ Pesticide scan

Aldrin, Whl Smpl	ug/l	0.00
DDD, Whl Smpl	ug/l	0.00
DDE, Whl Smpl	ug/l	0.00
DDT, Whl Smpl	ug/l	0.00
Dieldrin, Whl Smpl	ug/l	0.00
Chlordane, Whl Smpl	ug/l	0.00
Endrin, Whl Smpl	ug/l	0.00
Heptachlor, Whl Smpl	ug/l	0.00
Heptachlor Epoxide, Whl Smpl	ug/l	0.00
Lindane, Whl Smpl	ug/l	0.00
Methoxychlor, Whl Smpl	ug/l	0.00
Malathion, Whl Smpl	ug/l	0.00
Parathion, Whl Smpl	ug/l	0.00
Methyl Parathion, Whl Smpl	ug/l	0.00

[illegible] 0.00

1-27-11

Reported 8-11-77

Laboratory B

Lab No. 20485

Analyst 8/11/77 T.G.

Station: Unnamed trib. to E. Fork Mill Creek

Station Code

County: Butler

Collected by: Ken Harsa

Phone:

Location of Sample: @ Skinner Landfill - downstream

Sample Code

Date of grab sample (or last date of composite sample): Year 77 Month 07 Day 25 Hour 11 Minute 30

Composite

Sample Types: ☐ Ground Water ☐ Industrial ☐ Sewage ☐ Comp Mon ☐ Water Supply ☒ Stream

Beginning Date of Composite Sample: Year Month Day Hour Minute

Analysis to be Reported to: ☐ CO ☐ CDO ☐ SE ☐ NE ☒ SW ☐ NW

REASON FOR TAKING SAMPLE — ADDITIONAL INFORMATION — REMARKS BY ANALYST:

Probable Legal Action

PRESERVATIVE:
- ☐ ... OH
- ☐ $CuSO_4$
- ☐ H_2SO_4
- ☐ ... O_3
- ☐ OTHER

AUG 16 RECD

(or indicate by checking boxes)

☐	pH			
☐	Flow	Y2		CFS
☐	Water Temperature, Field	Y3		C°
☐	pH Field	Y4		S.U.
☐	Dissolved Oxygen, Field	Y5		mg/l
☐	Hydrogen Sulfide, Field	Y6		mg/l
☐	Ammonia Free Ant, Field	Y7		mg/l
☐	Ammonia Tot Read, Field	Y8		mg/l
☐	Color	Y9		Pt-Co
☐	[illegible]	W0		T.U.
☐	Turbidity	W1		FTU
☒	Conductivity at 25 C°	W2	820	u-MHO
☒	pH Lab	W3	7.8	S.U.
☐	$CaCO_3$ Stability	W4		S.U.
☐	Alkalinity Total $CaCO_3$	W5		mg/l
☐	Alkalinity Phen. $CaCO_3$	W6		mg/l
☐	... $CaCO_3$ Stab	W7		mg/l
☐	Carbon Dioxide CO_2	W8		mg/l
☐	Acidity Total $CaCO_3$	W9		mg/l
☐	Acidity M.O. $CaCO_3$	W0		mg/l
☐	Hardness Total $CaCO_3$	X1		mg/l
☐	Residue Total	X2		mg/l
☐	Residue Total Volatile	X3		mg/l
☐	Residue Total Filt (Diss)	X4		mg/l
☐	Residue Vol Filt	X5		mg/l
☐	Residue Total Flt (Diss)	X6		mg/l
☐	Residue Vol Flt	X7		mg/l
☐	Residue Settable	X8		mg/l
☐	Nitrogen Organic N	X9		mg/l
☒	Nitrogen Ammonia N	X0	017	mg/l
☐	Nitrite, N	Y1		mg/l
☒	Nitrate, N	Y2	005	mg/l
☒	Phosphorus Total, P	Y3	037	mg/l
☐	Phosphorus Soluble, P	Y4		mg/l
☐	Phosphate Total, PO_4	Y5		mg/l
☐	Phosphate Ortho, PO_4	Y6		mg/l
☐	Sulfate, SO_4	Y7		mg/l
☐	Sulfite, SO_3	Y8		mg/l
☐	Sulfide, S	Y9		mg/l
☒	Chloride, Cl	Y0	56	mg/l

☐	Fluoride Diss. F	H1		mg/l
☐	Calcium Total, Ca	H2		mg/l
☐	Magnesium Total, Mg	H3		mg/l
☐	Potassium Total, K	H4		mg/l
☐	Sodium Total, Na	H5		mg/l
☐	Aluminum Total, Al	H6		ug/l
☐	Antimony Total, Sb	H7		ug/l
☒	Arsenic Total, As	H8	<10	ug/l
☐	Barium Total, Ba	H9		ug/l
☐	Beryllium Total, Be	H0		ug/l
☐	Bismuth Total, Bi	J1		ug/l
☐	Boron Total, B	J2		ug/l
☒	Cadmium Total, Cd	J3	<5	ug/l
☒	Chromium Total, Cr	J4	<30	ug/l
☐	Chromium Hex. Cr	J5		ug/l
☐	Cobalt Total, Co	J6		ug/l
☒	Copper Total, Cu	J7	<30	ug/l
☐	Iron Total, Fe	J8		ug/l
☐	Iron Diss. Fe	J9		ug/l
☐	Iron Ferrous, Fe	J0		ug/l
☒	Lead Total, Pb	K1	6	ug/l
☐	Lithium Total, Li	K2		ug/l
☐	Manganese Total, Mn	K3		ug/l
☐	Mercury Total, Hg	K4		ug/l
☐	Molybdenum Total, Mo	K5		ug/l
☐	Nickel Total, Ni	K6		ug/l
☐	Selenium Total, Se	K7		ug/l
☐	Silver Total, Ag	K8		ug/l
☐	Strontium Total, Sr	K9		ug/l
☐	Thallium Total, Tl	K0		ug/l
☐	Tin Total, Sn	L1		ug/l
☐	Titanium Total, Ti	L2		ug/l
☐	Tungsten Total, T	L3		ug/l
☐	Vanadium Total, V	L4		ug/l
☒	Zinc Total, Zn	L5	<30	ug/l
☐	Zirconium Total, Zr	L6		ug/l
☐	BOD, 5-Day	L7		mg/l
☐	COD	L8		mg/l
☐	Chlorine Demand, 15 min	L9		mg/l
☒	Carbon Total Org. C	L0	<1	mg/l

☐	[illegible]	N1	
☐	MBAS	N2	
☐	Oil-Grease, Total	N3	
☒	Phenols	N4	<2
☐	Tannin Lignin	N5	
☐	Aldrin, Whl Smpl	N6	
☐	DDD, Whl Smpl	N7	
☐	DDE, Whl Smpl	N8	
☐	DDT, Whl Smpl	N9	
☐	Dieldrin, Whl Smpl	N0	
☐	Chlordane, Whl Smpl	M1	
☐	Endrin, Whl Smpl	M2	
☐	Heptachlor, Whl Smpl	M3	
☐	Heptchlr-Epoxide, Whl Smpl	M4	
☐	Lindane, Whl Smpl	M5	
☐	Methoxychlor, Whl Smpl	M6	
☐	Malathion, Whl Smpl	M7	
☐	Parathion, Whl Smpl	M8	
☐	Methyl Parathion, Whl Smpl	M9	
☐	Beta, Total	M0	
☐	Beta, Diss	.1	
☐	Beta, Susp	.2	
☐	Alpha, Total	.3	
☐	Alpha, Diss	.4	
☐	Alpha, Susp	.5	
☐	Radium 226, Total	.6	
☐	Strontium 90, Total	.7	
☐	Coliform Total, MF	.8	
☐	Coliform Total MPN, Conf	.9	
☐	Fecal Coli Total, MF	.0	
☐	Fecal Strep Total, MF	.1	
☐	Plate Count, Total	.2	
☐	Algae, Total	.3	
☐	TOD	.4	
☐	DIC	.5	
☐	TKN	.6	
☐	Conductivity, Field	.7	
☐			
☐			
☐			

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APPENDIX E

RESUMES

R. Michael Bort, P.E.

Registration

Registered Professional Engineer in the States of Louisiana, Missouri, North Dakota and Pennsylvania.

Fields of Competence

Engineering design and construction management for solid and hazardous waste facilities including landfills, impoundments, slurry walls, sludge stabilization and appurtenant structures; geotechnical and structural engineering for remedial investigations and facility design; design, operation and management of resource recovery systems; statistical analyses; computer programming; hydraulics; and construction specification writing.

Experience Summary

Over ten years of experience participating in multidisciplinary projects in waste management, including slurry walls. The projects have encompassed expertise in hydrogeology, geotechnical and structural engineering, statistical analysis, computer programming and construction management. Eight years as a track supervisor with a railroad company. Duties included construction management of general civil and structural projects including: planning and implementation; daily scheduling and supervision of railroad forces and contractors; ordering and distribution of materials; coordination with other railroad departments, contractors and civilian authorities; quality control and documentation for corporate review.

Credentials

A.A.S., Civil Technology—Eire County Technical Institute (1969)

B.S., Civil Engineering (Hydraulics and Structural Specialty)—Carnegie-Mellon University (1978)

M.S., Civil Engineering (Geotechnical Specialty)—Carnegie-Mellon University (1980)

Tau Beta Pi

American Society of Civil Engineers

Employment History

1985-Present	WESTON
1978-1985	D'Appolonia Waste Management Services/IT Corporation
1969-1977	Penn Central Railroad/Consolidated Railroad Corporation (Conrail)

Key Projects

Project Manager and principal investigator for conceptual design and permit negotiation for the closure of existing hazardous waste landfills and settling ponds for a proposed hazardous waste landfill in southern Mississippi. Work included field investigations, sludge solidification/dewatering studies, cost estimation, waste quantification and characterization, and agency interaction.

Project Manager for design and permitting of a 250,000-cubic-yard hazardous waste landfill in Alabama. The scope of work included field investigation, waste and leachate characterization and compatibility studies, Part B Permit preparation, preparation of construction documents including plans and specifications, agency interaction and construction oversight.

Project Construction Manager for the installation of over 10,000 lineal feet of slurry trench cutoff walls to depths ranging to 45 feet, retrofitting of an existing concrete lined surface impoundment with a synthetic liner and construction of a 17-acre lined surface impoundment.

Senior Project Engineer for the conceptual and final design of two Louisiana industrial hazardous waste disposal facilities. Responsibilities included geotechnical aspects such as development of subsurface investigation programs, design of dikes, lined and unlined collection ponds and appurtenant structures. Other responsibilities included cost estimating, construction methods and sequencing and client/agency interface.

Senior Project Engineer for the conceptual design of a synthetic-lined waste disposal area for the largest such non-commercial facility in the United States. Respon-

Professional Profile

P. Krishnan, Ph.D., P.E.

Registration

Registered Professional Engineer in the State of Pennsylvania.

Fields of Competence

Process/project engineering and management with emphasis on industrial wastewater treatment and sludge disposal and hazardous waste management and control. Areas of expertise include problem definition surveys and wastewater characterization, laboratory/pilot scale treatability studies, process design of physical, chemical and biological treatment, sludge handling and disposal and heavy metals removal, and environmental permitting.

Experience Summary

Sixteen years professional experience in various areas of environmental engineering related to industrial wastewater treatment. Project assignments covered a wide range of industry: pulp and paper; petroleum refining; petrochemicals; organic and intermediate chemicals; metals finishing; sugar refining; edible oil refining; textile mills; automotive industry; gasohol manufacturing; steel mills including coke manufacturing; coal gasification; paints and resins; steam and electric power generation.

Credentials

B.E., Civil Engineering—University of Madras, India

M.SC., Public Health Engineering—University of Madras, India

Ph.D., Environmental Engineering—Oklahoma State University

Water Pollution Control Federation

American Academy of Environmental Engineers

Honors and Awards

Recipient of Willem Rudolfs medal for outstanding contribution in industrial waste control.

Employment History

1982-Present	WESTON
1979-1982	Davy McKee Corporation
1977-1979	Harza Engineering Company
1967-1977	WESTON

Key Projects

Planning and execution of pilot scale treatability studies, using sandfilter-activated carbon and pilot scale evaluation of two stage centrifugation, for sludge dewatering and oil recovery for a petroleum refining complex located in Marcus Hook, PA. Resulted in design and construction of sandfilter-activated carbon adsorption facilities.

Planning and execution of a 5-year wastewater survey for establishment of wasteload allocation for wastewater discharge to the Delaware River, and evaluation of in-plant modifications for waste load reduction to achieve compliance with the existing discharge regulations for a sugar refinery located in Philadelphia, PA. Resulted in meeting the discharge requirement with various in-plant modifications instead of end-of-pipe treatment.

Evaluated technical alternatives and economical evaluation of various sludge dispo al options for sludge resulting from biological t tment of wastewater discharges from a petroleum refining located in Baton Rouge, LA and a pulp and paper mill located in Pasadena, TX.

Pilot scale treatability studies using plastic media trickling filter and activated sludge systems. Results were used to obtain parameters for the design of biological treatment facilities for a petrochemical complex located in Baton Rouge, LA.

Preparation of Remedial Action Master Plan (RAMP) for a hazardous landfill site containing PCB wastes.

Overseas assignment in Egypt for the wastewater treatment evaluation for an edible oil refining and a textile mill.

Professional Profile

Michael Loch

Fields of Competence

Hazardous waste management including site characterization and field investigation; source and ambient air pollution monitoring and analysis; development and costing of hazardous waste clean-ups; and SPCC inspection procedures.

Experience Summary

Experience in the field of source and ambient air monitoring. Currently a member of the U.S. EPA Technical Assistance Team trained and experienced in emergency spill response procedures, site characterization, SPCC regulations and inspections and management of hazardous waste cleanups.

Credentials

B.S., Environmental Engineering—Montana College of Mineral Science and Technology (1983)

Employment History

1983-Present	WESTON
1983	Clean Air Engineering, Inc.

Key Projects

Prepared the cleanup scope of work for the removal of approximately 1 million gallons of cyanide waste at the Autolon site in Kalamazoo, Michigan.

Compiled extensive information on hazardous waste disposal facilities throughout U.S. EPA Region V and incorporated it into a source document to be used during emergency action cleanups.

Conducted SPCC inspection throughout Region V for numerous types of bulk oil storage facilities and a wide variety of industrial plants.

Field Team Leader for source testing and evaluation of emissions at power plants throughout the country.

Professional Profile

Earl M. Hansen, Ph.D.

Fields of Competence

Trace organic and inorganic analysis using U.S. EPA, ASTM, AIHA methodology; analytical methods development; collection and analysis of environmental samples including ambient air, stationary source discharges, water, wastewater, biological tissue, biological fluids, soils, sediments and hazardous waste; development and implementation of laboratory quality assurance and quality control programs.

Experience Summary

Fourteen years experience in the following areas:

Preparation and analysis of environmental samples for inorganic and organic analytes using GC, GC/MS, AA, ICP, HPLC and wet chemical techniques. Method development for selected priority pollutant analytes in chemical process wastewater as part of U.S. EPA BAT program.

Development of methods for analysis of tetrachlorinated dibenzo-dioxin (TCDD) isomers in organic liquids and commercial chlorinated phenols using GC/MS selected ion monitoring techniques.

Methods validation for use of volatile organic sampling train (VOST) to collect and analyze volatile organic emissions from hazardous waste incinerators. Sampling and analysis of selected analytes in multimedia emissions from Refuse Derived Fuel (RDF) Waste-to-Energy processes.

Credentials

B.A., Chemistry—Wittenberg University (1963)

Ph.D., Chemistry—Michigan State University (1970)

Employment History

1984-Present	WESTON
1982-1984	Envirodyne Engineers, Inc.
1977-1982	Midwest Research Institute
1973-1977	Snell Environmental Group
1972-1973	Clyde E. Williams and Associates
1969-1972	Notre Dame University

Key Projects

Managed a program to analyze environmental samples for 2,3,7,8,-TCDD for the U.S. EPA. This program required the analysis of over 2,000 environmental samples in 1983.

Managed a sampling and analysis contract for U.S. EPA at Research Triangle Park, North Carolina. This program focused on the evaluation of a volatile organic sampling train (VOST) for the collection of volatile organic compounds from the gaseous effluents of hazardous waste incinerators. Directed the construction of two VOST trains and developed a protocol for the use of VOST to evaluate the performance of hazardous waste incinerators.

Managed five laboratory tasks as part of a contract with United States Army Toxic and Hazardous Materials Agency (USATHAMA) for contamination survey of Army installation. This included development and validation of methods for selected analytes using the USATHAMA Quality Assurance Procedure.

Participated in the design and preliminary evaluation of a laboratory-scale thermal destruction system to be used to evaluate the feasibility of incineration of liquid and solid hazardous wastes. Directed a multi-task program which required quick response methods evaluation and analysis of groundwaters and soils from hazardous waste disposal sites. Samples received in this program were analyzed for substituted phenols and polynuclear aromatic hydrocarbons (PAH's) using GC/MS and HPLC.

Managed a program to analyze process wastewaters from six organic chemical manufacturing plants. This program was conducted for the U.S. EPA to identify and quantify the presence of organic and inorganic priority pollutants in these wastewaters. The project required design of sampling plans, development and evaluation of analytical methods, and collection and analysis of over 250 samples. These data were incorporated into the database which, is to be used by U.S. EPA to establish Best Available Treatment Technology (BAT) regulations for the organic chemical manufacturing industry.

Led the evaluation, selection, and recommendation of an inductively-coupled plasma (ICP) spectrophotometer which was purchased as an addition to MRI's atomic spectroscopy instrumentation in 1981.

Professional Profile

Dianne S. Therry

Fields of Competence

Laboratory QA/QC development and implementation; data management coordination, including quality assurance and quality control procedures; identification and quantification of chemicals through the use of instrumental and wet methods of analysis; chemical and microbiological analysis of potable, surface, and wastewater.

Experience Summary

Laboratory QA/QC requirements including compilation of analytical lab SOP's and maintaining and updating the lab QA/QC Manual; conducting laboratory audits, maintenance of certification records and requirements. As Data Management Coordinator: track sample status from log-in through final reporting and sample disposal; prepare lab QA samples and subsequent performance reports; interface with clients and regulatory agencies for monitoring/auditing purposes. Analysis of process and industrial waters; quality control checks of water treatment chemicals; chemical and microbiological analysis of streams, drinking water, and domestic and industrial wastewater using EPA and APHA Standard Methods of Analysis. Methodology includes wet methods of analysis, AA, GC, Auto Analyzer, and TOC.

Credentials

B.S., Chemistry Education—West Chester State College (1974), ACS Accredited Program.

Post-graduate courses in priority pollutants techniques of analysis; gas chromatography; water microbiology; toxicology; geochemistry; geological field studies; physics of the atom. Refresher courses in AA and GC.

Certified by EPA and the State of Pennsylvania to perform and supervise water microbiology.

American Chemical Society, Philadelphia Local Section, Division of Environmental Chemistry

Employment History

1982-Present	WESTON
1977-1982	Chester County Health Department Public Health Laboratory
Winter-Summer 1977	Nalco Chemical Company
1974-1976	West Windsor-Plainsboro High School

Key Projects

Completed documentation of methods for USATHAMA certification of the analytical laboratory. Responsible for monitoring lab QA activities and maintaining related records for major government project.

Completed documentation and other items necessary to receive EPA microbiological certification for the Chester County Health Department Laboratory.

Coordination of the Health Department Laboratory involvement in a quarterly stream monitoring program of Chester County streams.

Set up and instituted a training program for operation and maintenance of the Technicon Auto Analyzer II for nutrient parameters in water analysis.

Development of standard operating procedures for the laboratory, including QA/QC development and implementation to meet certification requirements and to ensure the timeliness and accuracy of the laboratory's work.

Interim Director of a water testing laboratory for one year involving routine chemist's duties plus monthly and annual laboratory statistics and budget preparation.

Development and implementation of an academic chemistry program for high school students.

Professional Profile